PRINTING ON COTTON AT AHMEDABAD, INDIA IN 1678

By PAUL R. SCHWARTZ

Votre tres- humble. Et tres
obeissant Seruiteur
G. Roques

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S P

CALICO MUSEUM OF TEXTILES, AHMEDABAD, INDIA
MUSEUM MONOGRAPH No. 1

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Printing on Cotton at Ahmedabad, India in 1678

From an unedited manuscript in
the Bibliothèque Nationale, Paris

By PAUL R. SCHWARTZ
Président du Musée de L'Impression sur Etoffes, Mulhouse

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Preface

Eye-witness accounts of Indian cotton painters and printers at work prior to the nineteenth century are rare, and the few which have hitherto come to light among European records relate exclusively to the Madras coast. In 1965, however, when researching at the Bibliothèque nationale, Paris, the discovery was made by Mr. John Irwin of an uncatalogued manuscript-volume describing the cotton-printing centres of Western India in the late seventeenth century. The volume consisted of 333 pages under the title *La manière de nègocier dans les Indes Orientales* (ref. no. F. Fr. 14614). The author was Georges Roques, agent of the Compagnie des Indes, who wrote it between 1678 and 1680 for the guidance of the company's chief agent at Surat, to whom it is addressed. The volume was referred to the late Monsieur P. R. Schwartz, eminent authority on the history of dye-chemistry, who decided to edit the three chapters on cotton-printing at Ahmedabad for publication in the Bulletin de la Société Industrielle de Mulhouse. The contribution appeared in the volume for 1967. Here we publish a translation by Miss Margaret Hall. The remainder of the Roques ms., including chapters on visits to Burhanpur and Sironj, remain unpublished.

Since Monsieur Schwartz' article was first published, it has been possible to make a definite identification of the dye-root *saranguy* or *al*, which Roques describes as producing "a beautiful red, vivid and deep." It is the root of the morinda tree, of which there are several species, most of which yield a good red dye from the roots. The tree seen by Roques was *Morinda citrifolia*, or possibly the closely related species *Morinda tinctorium* later differentiated by Roxburgh. The roots of these trees, still known by the names of *saranguy* or *al*, were in use in many parts of India until the end of the nineteenth century, usually being employed as a cheap substitute for madder.

Today, Ahmedabad is a great industrial city dependant upon textile manufacture as its main trade. Despite the competition of the great cotton mills and of small workshops engaged on screen-printing, hand-block printing still survives in Ahmedabad for the printing of *saris* worn by the local countrywomen, and other traditional cloths for local use. The cotton printers still bring their cloths to the river Sabarmati to be washed. The river runs through a broad sandy bed, where the cloths are laid out to dry in the sun as soon as they are taken from the water. The photographs of the cotton printers at work which illustrate this monograph were taken in 1968 by Calico Photographic Studio, and show how closely Roques observed some of the features of the work, and how little these have changed. The photograph of a block-cutter reproduced at Plate I has been kindly supplied by the National Institute of Design, Ahmedabad. The main centre of block-making is now at Pethapur, a village on the outskirts of Ahmedabad.

Calico Museum of Textiles
Ahmedabad

May, 1969.

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Printing on Cotton at Ahmedabad, India in 1678

From an unedited manuscript in the Bibliotheque Nationale, Paris

THE manuscript which we reproduce and study in this article had remained completely unknown to historians of chintz until a fairly recent date,[1] and resolves finally the difficult question of knowing the method of *printing* in India in former ages. We had, in fact, no precise information except for the manufacture of *painted* cloths, and that only for certain localities on the Coromandel Coast.[2] We knew, from the accounts of travellers of the 16th and 17th centuries, and particularly from the archives of the English East India Company, that the country produced just as many *printed* cloths, but the terms employed were often obscure; they even spoke of " printed painted cloths " (*sic*.), which did not make easier the interpretation of the texts.[3] In the absence of complete technical information, one might wonder if this printing was being done with thickened mordants and afterwards dyed in madder; or with colours directly applied (insoluble pigments diluted in a viscous supporting medium, thickened decoctions of tinctorial woods and plants); the more so because the printed cloths were usually described as being far inferior in quality to the painted fabrics.

The present document removes all doubts on this subject. As we shall see, it is not Europe which can claim the distinction of having been the first to print with thickened mordants with the aid of wood blocks, as many authors ancient and modern had believed could be affirmed, though without formal proof.[4] We must now concede to India a priority beyond all dispute.

THE REPORT OF MONSIEUR ROQUES, OF THE ROYAL COMPANY OF FRANCE

The reference number of the manuscript in the Bibliothèque Nationale in Paris is FR. 14614; another old reference mark, R.B. No. 4603 (1847) is also found in the volume. It has not been possible, to date, to discover how and when the document was acquired by the Bibliothèque Nationale, nor who might have been able to make use of it.

Francois Martin (*c*. 1640–1706), the founder of the French empire in the East Indies, left memoirs which do not seem to have been published. They are preserved in the Archives Nationales in Paris, and cover the period from 1664 to

February 1694, the date at which the author came to Chandernagar. A copy made by P. Margry is in the Bibliothèque Nationale in Paris, with the acquisition number 9348–9351. The following passage is quoted from the Manuscript in the Archives Nationales, Tx 1169, folio 296 verso : " Preliminary measures had been taken at Surat to initiate the Company's trade as soon as news of the peace might be received; Monsieur Roques had been sent to Sironj and other centres of manufacture in October 1678." The document is entitled "Memoir on the establishment of the French colonies in the East Indies, drawn up by Messire Fr. Martin, Governor of the town and Fort Louis at Pondicherry." The peace to which this refers is that concluded between France and Holland on 10th August 1678 at Nimeguen, but of which Martin, in India, could not yet have been aware in October 1678.

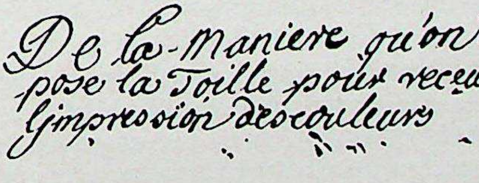
The Dutch East India Company had been formed in 1602 by a merger of companies operating since 1592. The English Company was formed in 1600, and the Danish in 1612, but the French Company was not founded until 1664, the year in which Francois Martin begins his memoir. Kaeppelin, in " The East India Company and Francois Martin " (*La Compagnie des Indes orientales et Francois Martin*, Paris, 1908), tells us that Roques arrived at Surat on 16th October 1676. He had thus had nearly two years' experience by the time he set off on his business tour of the area. His report is addressed to his superior, Monsieur Baron, the Director General,[5] and is divided into three sections, the third of which is incomplete " for want of new material "; but it is included so that the recipient can estimate the possibilities of Sironj.

The work is entitled : " The method of trading in the East Indies, dedicated to my dear friends and colleagues, the employees of the Royal Company of France." After a letter to Baron and a preface, the manuscript begins on Page 1 and ends on Page 333. The pagination is faulty, however; page 88 is missing, and page 89 appears in place of it; similarly, page 272 is replaced by page 273. On the other hand, two pages are numbered 183, one of which replaces page 182. But the odd thing is that all the page numbers which are missing from the text appear in the index, which is very complete. We are apparently confronted with a copy, in which the transcriber has made some errors.

The chapter headings do not tally with the index. For instance, we read in the text : " Of the saranguy root " (*de la racine saranguy*), and in the index, a far more precise and interesting description : " Of the saranguy root, or *ronas* of India." (*De la racine saranguy ou ronas d'Inde.*)

One can see that the first volume ends before page 92, where Roques has written " of which I have spoken in the other book." The second volume ends at page 171; and volume 3 probably ended after the information concerning Sironj at page 213, but was ultimately completed, partly after the death of Baron, which occurred on the 14th May 1683. Indeed, the year 1688 is mentioned on pages 275, 300 and 306; " May 1691 "[6] is found on page 292, and " September 1691 " on page 305. However, the pages 155 to 171, dealing with printing on cotton, certainly date from 1678, because page 172 is entitled " Departure from Ahmedabad for Sironj, the first of May 1678, 3rd Volume." On page 112 we find " this year 1678 "; but on page 226, " encounter which happened at Sironj at the end of the year 1678," which seems to confirm that this observation has been recorded later.

It is difficult to know whether, copy or not, the entire manuscript is by the same hand and the same author, since we do not yet know the date of Roques' death. Thirteen years separate the first and last dates furnished by the document, which are 1678 and 1691; but Baron, to whom the work is addressed, died in 1683. Yet we read on the last page before the index the following lines : " There are many other useful observations which are better spoken by word of mouth than set down in writing; there is sufficient in these three volumes (*sic.*) to be examined and closely studied." Moreover, until the end, the term " I " is employed.[7]



De la Maniere qu'on dis=
pose la Toille pour receuoir
l'impression des couleurs

The Roques Manuscript of 1678

OF THE PAINTERS AND PAINTING OF CHITTES

The cloths which one reserves for *chittes*[8] are not all entirely suitable for receiving the fine colour. A distinction should be made between these cloths, and those which are to be bleached;[9] the fabrication should be different. For bleaching, one would choose the strongest and most closely woven cloths; but for painting, quite the reverse, those which are soft, and less closely beaten. The reason is that if they were too hard, the colour which the painter prints could not penetrate, and would remain on the surface of the cloth, to be lost at the second tanning.[10] One should choose cloths which are soft, and above all of good cotton yarn ; that is to say, the warp threads should not be too tightly twisted, and should correspond in parity with the weft, to make the fabric even and smooth, so that the block can be fully applied, and so that the surface bloom shall not become cracked. I have not as yet found anyone, among those who order the making of *chittes*, who is aware of this fact, which is nevertheless the most essential factor in yielding a *chitte* without flaw. They send the cloths to the painters just as they buy them, without examining them; and afterwards blame these painters when the work is not successful; for which they are not responsible, but the fault is with us, because they work upon what we give them.

Another point is to keep watch during the application of the blocks, that they are well cleaned; and make them remove the dirt frequently; for if the pigment is sticky,[11] when it begins to dry in the engraved lines of the block it fills some passages in the design, rendering these imperfect in the printing.

Before the painter uses any of the blocks which you have chosen, inspect them very carefully, to see that there is no broken point, or that he has not covered some flaw with wax. Furthermore, compare them to ensure they are well proportioned in the squares ; this last is very important, for it they are narrower at one end than the other, they will make dirty tracks between the flowers, and they cannot follow the straight line.[12] It is better to undertake the expense of having new ones made.

You should also take care, and be quite forceful with the painters, to make them apply the blocks with care. It concerns them little whether the work is well or badly done, because they are paid in advance, according to custom. They do in haste as much as they can, to have the pieces finished soon, and in this precipitous hurry, mistaking the line which they have laid down, on which to apply the block ;[13] thus making the spacing disordered for the other colours, and making the chintz pattern look crooked when the piece is fully displayed. To be precise, in a large batch there will be many pieces with this defect. One could not avoid it, except by engaging a man to keep watch on each painter; which would be as many as two or three hundred men, who must be paid, for one is dealing with as many painters. But what one should do is to visit them frequently, make surveys on all sides, see them at work, and give a few rupees to the boys, in order that they may be more accurate; and encourage them to work well by kindness and the prospect of a good reward when they please you. This is the maxim which I have practised, and which seems to me the best.

All types of blocks are not suitable for the same fabrics. A fine sharp block cannot be used on a coarse cloth; still less if it is rough, that is to say if the grain is raised and irregular, for the block would be cracked at the second blow in printing. The workman would then be unable to use it. The blocks must be strong in proportion to the body of the cloth, and the fine sharp ones used for the finest fabrics. This consideration has obliged me to have them made at the Company's expense, with the further advantage of having *chittes* with new designs. The reason why the fine *chittes* have the most delicately worked designs and are more becoming in wear than the ordinary ones is this: the blocks are more artistically made and glide smoothly[14] without resistance, because the fine cloth is consistent with them; whereas if they were used on coarse cloth, the worker could not use them a second time. The blocks which they have for their own use are more substantial, in order to last several years, although the outlay on them would not be great. Each one has cost only half a rupee for the little pieces which are inset[15] in the pattern and one rupee for the principal block. These little inset pieces are used for changes of colours, and each one has only a portion of a flower, when the *chitte* is of several colours like the *pancheranguis*.[16] If they are of two colours like the *jafracanis*,[17] a single block suffices with one small piece; but for the *pancheranguis* sometimes up to ten pieces are necessary, which are only applied one at a time; therefore the worker spends a great deal of time, and also charges double or triple for his labour.

Not all seasons of the year are favourable for work on the *chittes*. There is only the period from the month of October to June, and very often they cannot work until the end of October because the waters are not sufficiently clear due to the four months of rain, which sometimes begins in May; so that they cease work for four months in all. In addition to clear and calm weather, they need a radiant sun which dries their work quickly; and very clear clean waters to wash out the dross of the printing and the dirt which attaches itself. Cold and damp conditions are adverse to it, and also to the bleaching. It is necessary to take very careful measures, to arrange for the fabrication of the cloths; to have them bleached and painted; and to have them delivered on board the ships in December, for which a great deal of time is needed, according to the places from which they come.

It does not depend entirely upon you to make all these provisions; for at the same time the artisans and painters are overburdened from all sides by the three nations,[18] by the Moors, Armenians, Turks, *banians*, commission agents and others; and as they work with such headlong haste you cannot expect satisfaction in their handiwork, which will be badly done. The work often remains in their houses and they are unable to deliver it in time, because they have been bribed by others who will give them more money than you. As there is no justice in India, and you have to deal with pitiable wretches, you must endure all this to your great frustration. The best expedient which I have found is that which I have advocated before; to have the work done one year for the next. You may greatly increase your interests in the opportunities which present themselves in purchases which are advantageous to you through the choice of merchandise; and also by the respect of the painters, who work with more diligence when not troubled by so many persecutors. You have also the satisfaction of doing things better; of inventing new designs; of getting the blocks mended and ordering others; for there are only three of these block-carvers in Ahmedabad, of whom two are quite good; the other makes nothing of merit. If you do not win over these people by gentleness, followed by some gift, you will have none of their handiwork, for they do not lack business for others. In conclusion, you cannot do business in India as you would in France, because you cannot find any reliable basis for any promise which is given you, which may be more falsehood than truth. I have already spoken so much of the bad faith and conscience of the Indians that I shall make myself tedious if I broach it again in this chapter. It is better that the reader diverts himself by reading of the method by which they make the *chittes* in Ahmedabad.

THE COVENANTS WITH THE PAINTERS

When you have selected the cloths which are suitable for painting (which few people do, though it is very important), you send for the leader of a group of painters (*le caporal d'une escouade de peintres*); for within each of the settlements there is one who has precedence over the others, and with whom you agree upon the price, according to the quality and nature of the cloths which you have reserved for him. You give him a written note, and make your covenant with him as advantageously as you can. The principles are that if the merchandise is burnt or damaged by accident of fire, they are not bound to pay you for it; if someone steals them from the river bank when they put them to soak and dry, or if they corrode in the cauldron,[19] that is also to your charge; but if they are lost in the houses, the liability is theirs; that you advance them one half of the money at once to purchase the dye-stuffs; and the other half before the application of the green, for the chintz is then three-quarters ready[20]; that they are to deliver them to you within two months (though it may well be four). In all these covenants there is no penalty for the defaulter, for it is not the custom. They are all to the disadvantage of the merchant who risks his goods in their hands without any guarantee, yet this is what all the others do. You ask the painter for a selection of prints from his blocks, on paper,[21] for they have these and have used them for a long time past. If one pleases you, mark it and write the number of *courges*[22] that he should make from this design. If he has none which suit you, lend him some of your own, on condition that he does not use them except upon your cloths. This being done, make a list of all the workers, and make him a small gift, so that he will indicate to you the best ones; whom you note down in a book, with the number of *courges* which you give to each. Then summon the leader of a neighbouring village; for it is there that they work, rather than in the town, in order to be nearer to the river. He will not rebate anything of the price you agreed with the first, which is a great prejudice. It is important, before concluding the matter, to discuss thoroughly the current state of the price of dye-stuffs, if they have been reduced or increased since the preceding year; you repeat this procedure until all your cloths are distributed, after having had them marked by a tailor or having applied your own mark with diluted copperas,[23] which becomes black in the cauldron. This preliminary care is your responsibility, and it now remains for them to do the rest.

THE METHOD OF PREPARING THE CLOTH TO RECEIVE THE IMPRINT OF THE COLOURS

Before the painter applies any colour to the cloth, he has it washed to remove the dressing[24] which the weaver has given to it, until it is half bleached. Then he puts it to steep in oil of *gingely* for five days if it is the hot season, and for double that time in the cold season. This *gingely* seed from which the oil is extracted is very small, white, and flat, and comes from the flower clusters of small shrubby trees; it is sown every year like cotton. There are two types, one flat and white in the form of a tear-drop, and the other black, which is like powder for a musket; but this last does not grow in all places, nor is it so abundant as the other.

After the cloth has thoroughly absorbed this oil, they daub it with camel-dung, which is best for this purpose. They leave it thus to dry, and wash it, then beat it to flatten the thread; or they ought to do this, but it may be too much trouble for them. This confirms what I said, that the cloth must be carefully chosen. Then they give the first application of dye, which is done with myrobalan, and imparts a pale dead-leaf tint. They then prepare a black colour, which they make also with myrobalan, and with wheaten flour soaked in water until it has become thoroughly sour; being thus prepared, they mix iron rust with it. All this boiled together makes a fast black, and in order that it shall hold fast, they put into this cauldron several *sers* of a gum which exudes from trees, so that it clings to the block and does not drip.[25]

All this being done, the painter spreads out the cloth lengthwise on the tables. He takes the first block of the pattern, which only distinguishes the outlines by its lines and hollows; soaks it in this black dye which is made like that of printers, and begins his cloth at the end of the piece. He makes a row along the left side, and continues with others in the same way until the width is filled. Having thus used the first block, he takes another of the same size which covers this one completely, and has the same pattern, but differently worked; for in the places where the first had raised outlines, those of the second are hollow. Its voids go directly on the imprint of the first, which it conserves entirely without any detriment to the colour. The remainder of the second block is without engraving, for it fills the ground of the cloth with the desired colour. When the ground, which may be red or violet, is dry, he takes one of the other little blocks which have a detail of the design; charges it with the selected colour and applies it between the black outlines of the first block. After this is dry, he applies a third block upon this last, which is worked in the form of rays, which give shading to the flower by little lines, which are ordinarily the colour of indigo. It should be noted that all which they wish to conserve white is covered; also the leaves which are to be green, which they do not apply until the cloth is finally washed, because they do not possess the secret of rendering it fast.[26]

When all this is done, they soak the *chitte* in hot water to remove the wax which has conserved the white and the green, take it to the river, shake it in the water and dry it in the sun when it is very hot. When it is thus dried, they shake it again in the water and put it to dry ; they do this work for about eight days, according as the season is right for it ; for as much as the sun gives heat, so also the colour becomes beautiful. The water has this faculty of contributing much to it, and it was known from experience that the river at Ahmedabad had that virtue above other waters. When all is dry, and the white is as they desire, they take it back to their houses to apply the green with a little block made for this purpose, and deliver it to you.

The root which they use to make the red is called *saranguy*, of the size of the sarsaparilla. I consider that our dyers in France might well make use of it. It has the property of producing a beautiful red, vivid and deep; it would be good to send several bales for trial. The other colours are made with ochre (*la locre*);[27] verdigris; indigo; alum; gall-nuts; pomegranate rind; myrobalan; copperas; wheaten flour; iron rust; and turmeric.

All that I have described with regard to the painting of the *chittes* makes known to the readers that although they are done with moulds, or to be better described, are imprinted with blocks of wood (for these are not like the moulds from which one makes bells), much time is needed for the work and for the printing. Great care should be taken by those who wish the *chittes* to be well done, to encourage the workers; to go frequently to the river to ensure that they soak them in the water often enough, which is necessary to produce a good colour; and to make them apply the blocks carefully, as I said at the beginning. I am surprised that those who traffic in this merchandise supervise it so little, and do not go to the workers' houses if time is pressing for delivery to the ship; leaving them to do as they fancy, which they take for the custom, and so are not well served. It no longer astonishes me to see chiefs of factories who hesitate, as one might say, to handle the merchandise; as if that charge which should put them under obligation to work with more care excused them for doing nothing, believing it is quite sufficient for their second or assistant to take it in hand. But this second or assistant has not the experience which you have, seeing that your superiors have judged you capable of filling the post. What do you know if your agent, who endeavours to bribe everyone, has not found a weakness in their spirit to be corrupted. I maintain that the chief of a factory should be more watchful of the business in his hands than a captain during a tempest; for he is always in danger of losing the property which he administers while he has business with the *banians*.[28] He should also resemble a good father of a family, correcting the mistakes of his inferiors by his good example; reprimanding them severely when they fail; knowing to the heart all which passes in his domain; that the business may not be consumed by thriftlessness. He should be more thrifty of the property of other people than of his own; his conscience obliges him to do this, for he is paid to conserve and augment it by his knowledge and industry (of which they think the least!) If he were looking after his own business, you would see it become more prosperous. Those who appoint these men should reflect seriously on this, and know thoroughly the life and habits of those whom they destine for such employment; for it is from them, as one may say, that the success or failure of the Companies depends; by their experience and capacity, or by their nonchalance. This, my dear friends and colleagues, is what I had to confide to you on leaving Ahmedabad for Sironj to seek the material to compose a third book and to present it to you, as I have done this one, in all the sincerity and frankness of my thoughts, because you do me the honour of believing me your very humble and obedient servant.

G Roques

Examination of the techniques employed, according to Roques' account

Of the three hundred and thirty pages comprising his manuscript, the seventeen which Roques devoted to the printing of cotton cloths at Ahmedabad are entitled : " The painters and painting of chittes "; " The covenants with the painters "; and " The method of preparing the cloth to receive the impression of the colours." It is in no sense a discussion of the cotton-painting method such as was practised on the Coromandel Coast, of which we have precise descriptions; no mention is made of the paintbrush, for the use of which we have the evidence of Beaulieu in 1734 and of Father Coeurdoux in 1742.[29] We are faced with a confusion of terms, which seems to have been general among travellers of the 16th and 17th centuries. If the workers in question are called " painters," it seems logical to assume that they *painted* their cloths; yet it is curious that Roques makes not a single allusion to the possibility of employing such a technique, at least at Ahmedabad, before his departure for Sironj on the 1st April 1678.

One can envisage that, according to the times, and to the availability of skilled labour, one craft was being abandoned in favour of another. For instance, in 1609 we find the English factor at Surat writing to the Directors in London that he had obtained from Burhanpur for export, large quantities of " *pintadoes*[30] of the finest sort "; whereas we read in Roques that in 1678 " They make there *chittes* from cloth produced in the neighbourhood, but narrow, coarse, and badly painted, which the villagers buy for their own use." (Roques Ms., page 183.) Note again that Roques, in the part of his manuscript which he devotes to the different fabrics which are made at Ahmedabad, and those which are imported to be worked upon there, expresses himself as follows : " The greatest trade which is done there consists of the *painting* of *chittes*, covers, floorspreads, palampores and turbans on all sorts of cloth." (Roques Ms., page 103.) And that, moreover, when he describes in detail what is purely a printing technique ! Thus when he uses the term " painter " in the report of his tour in Western India, it is absolutely impossible to know what he means by it, particularly when he states specifically that at Sironj, one of the objectives of his journey, " the town would not be much at all, there are few weavers and spinners ; the wealth of the place depends upon 400 houses of painters who bring prosperity by the cloths which are brought there from all the neighbouring districts . . . the French, English and Armenians, particularly the latter, buy these to have them made into *chittes jafracanis* for Persia, Bantam and Manila." (Roques Ms., pages 185-186.) What exactly was the work done in that locality ? Were the cloths painted, or printed, or were both techniques employed ? The question remains open, as it does also for the other places cited. (*Cf*. Note 43, Sironj.)

The wood-blocks used were of three types; one for the outlines of the designs; one for the ground; and a third type for the details, for which up to ten small blocks might be used. Not a single dimension is given. We are not told how they were manipulated; whether, for instance, the wood was cross-layered to avoid warping due to humidity; how they were engraved; nor if they were provided with pin-points for registration marks. In the whole of Ahmedabad, in 1678, there were only three engravers, two of whom were quite good, but the third useless. The blocks used by the local artisans were coarser and made to last for several years. Impressions from them, printed on paper, were kept to be shown to clients.

In order to obtain finer designs, and also new ones, Roques commissioned his own blocks. There is no mention of the designers. No reference is made to the patterns sent from Europe, although about 1640 the English Company was already asking its factors at Surat to take account of the tastes of the home market, and about 1662 the dispatch of English patterns became the general rule.

There is every reason to suppose that the use of these three types of block for printing on cotton was of very ancient date in India, and that Europe was not the innovator.

The worker prints first the outlines, then the ground, and then the details and the reserves of wax.[31] Ahmedabad prints seem generally to have had coloured grounds, either red or violet. Roques repeatedly describes them thus. In a letter of the 17th November 1643, the English company complained about the " sad red grounds " in its consignments from this town; they asked for more white grounds, but in 1647 the factor at Surat had to reply that he had been unable to obtain the desired change.[32] The method by which the colour was obtained is described in a rather confused fashion by Roques, who could not have understood it fully. Fortunately he lists the necessary ingredients : a root to produce the red; alum; iron rust; myrobalan; gall-nuts; pomegranate rinds; *terra merita* (turmeric); verdigris; copperas; indigo; wheaten flour moistened and become sour; a gum extracted from a tree; wax; and ochre.

The use of iron rust and of alum provides us with evidence for the use of mordants, the gum forming the thickening. Alum (double salt of aluminium and potassium) in its natural form furnished a mordant for red, while the mordant for black was obtained by discharging an acid (flour soaked and become sour) on the iron. Myrobalan and gall-nuts are astringents containing tannin, which give a black with the iron, just as copperas (sulphate of iron) does with these plants. Turmeric, which is soluble in water, furnished a yellow suitable for surface application, and formed a green when superimposed on the blue of the indigo. We recall that in the madder bath, the aluminium mordant (alum) produced, according to its degree of concentration, the reds and the pinks, and the iron mordant diluted or mixed with the mordant for red, produced violets. Other shades could be obtained with verdigris (sulphate of copper) and pomegranate rind, mixed with the mordants or with the colouring matters; these products also appear in European formulas, particularly in the 18th century. As for ochre, since Roques seems to be the only person to mention it, it is difficult to know how this clay-like earth colour was employed at that period for the manufacture of painted cottons. It could have been used as a pigmentary colour for surface application; that is to say, not as a dye, but as a colouring matter of only very relative fastness. Nevertheless, as it contains iron, it might be regarded as a true dye if the cloth were impregnated with tannin. The question therefore remains open until fuller information is available.

Roques' description of the successive operations is far from clear, and he does not seem to have been a good observer. The cloth is cleansed of dressing, and then immersed for several days in oil of gingely.[33] Next it is put into a bath of camel-dung and afterwards galled with a plant containing tannin, which gives a yellow tint to the cloth. At this stage, the marks which were put on after purchase should appear on the cloth; these were made " with diluted copperas which becomes black in the cauldron." But it is doubtful if the marks would have survived the removal of the dressing, the oil-bath, and the bath of camel-dung.

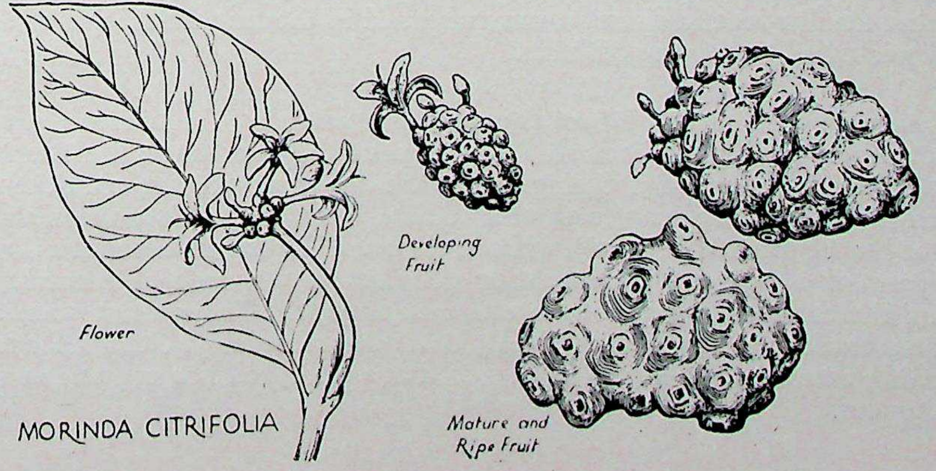
A black colour is then prepared. According to the description, certain ingredients are put into a cauldron at the same time : myrobalan; wheat-flour soaked in water and become sour; iron-rust; and gum; these are boiled all together. This gives a black, which is printed directly, like printers' ink, to form the outlines of the design. Next the mordants for red and violet are applied, then the reserve of wax, which is ultimately removed by immersing the cloth in hot water. Lastly, a yellow is printed on top of the blue to obtain green, doubtless with the use of turmeric or perhaps with the iron mordant, which has a yellowish tint.

Since the cloth was impregnated with tannin, one might well ask if it would not have been simpler to print directly with the iron mordant thickened with gum, the black forming itself on the fabric as the block came in contact with the cloth. This was the method used on the Coromandel Coast, though the mordant was painted and not printed. It is most unlikely that all the ingredients listed above were boiled together simultaneously ; probably the iron mordant (which would also be used for violet) was prepared first, and then thickened for printing. Moreover, it is doubtful whether the recipe described could have produced a good black. Only by repeating the procedure could the question be solved, and this has not yet been possible.

No indication is given of the method of preparing the vat of indigo.[34] In India, a fermentation vat was generally used, the temperature of which did not exceed the melting point of the wax which protected the areas of the cloth intended to remain white. In Europe, it was discovered—probably in the second quarter of the 18th century— that with the use of copperas, indigo could be reduced in a cold state; and this new vat, which was extremely practical, replaced the old fermentation vat (though for cotton only, as it is injurious to wool). The enumeration of copperas in the formidable array of dye-stuffs quoted by Roques does not, I think, permit a conclusion on the use in India, as early as 1678, of sulphate of iron for the reduction of indigo, since no information on the subject is so far forthcoming from any other source. Roques does not indicate the use of this product, other than to mark the pieces of cloth sent to the printer, the marks turning black on contact with the tannin impregnating the cloth.

The production of red is based on the use of a root. The chapter which Roques devotes to it—pages 204 and 205— is entitled " The saranguy root," and in the index, " The saranguy root or ronas of India." After telling us that the dyers of France had proved the use of sappan wood sent to Le Havre by the Compagnie several years earlier, and that they had declared themselves satisfied, the author thinks that it would be a good idea to make them acquainted with the saranguy root, to dye silk and woollen fabrics an excellent red, since this could not be achieved with campeachy wood (logwood) or Brazil wood.[35] Then comes a curious technical description : this root is grown in the neighbourhood of Sironj and is gathered after Divali,[36] that is to say in the month of October when the earth has become slightly firm after the floods of the rainy season have retreated. It grows from a large tree which has a trunk as thick as the narrator's body. Its branches face inward towards their centre, like those of the palm; it has leaves like those of a citron tree; it is called, in the language of the country, " ail." It produces a fruit like *les atiers*[37] shaped like a fir-cone, large and round as the ball used in the game of " pall-mall." When it is picked ripe, it is dried in the sun, then reduced to powder in a mortar. The powder is sown in small drills in the earth, which are then covered over. The root develops through the humidity of the soil; it swells, and creeps under the earth like the liquorice plant.

Concerning the term *ail*, it can be identified as *al*, the indigenous name for a dye-root of which a nineteenth century record was known to me.[38] An extensive examination of nineteenth century records by Miss Margaret Hall (to whom I am much indebted) revealed many more references to this dye-root, often named as " saranguy or *al*," and coupled with the botanical name *Morinda citrifolia*. It is always described as a root used by the native dyers as a cheap substitute for madder, and descriptions of their methods and processes show that these were basically the same as the madder-dyeing technique.[39] Botanical evidence confirmed beyond doubt that Roques is describing *Morinda citrifolia* (Linn), or possibly the closely related species *Morinda tinctoria* later differentiated by Roxburgh.[40] There are several species of Morinda, which are trees and shrubs of the order *Rubiaceae;* a few of the species grow as woody creepers. The Morinda are indigenous to many parts of India and Burma within the tropical belt, and the roots of several of the species are used as dye-stuffs and cultivated for this purpose. *Morinda citrifolia* and *Morinda tinctoria* both grow in the form of trees,

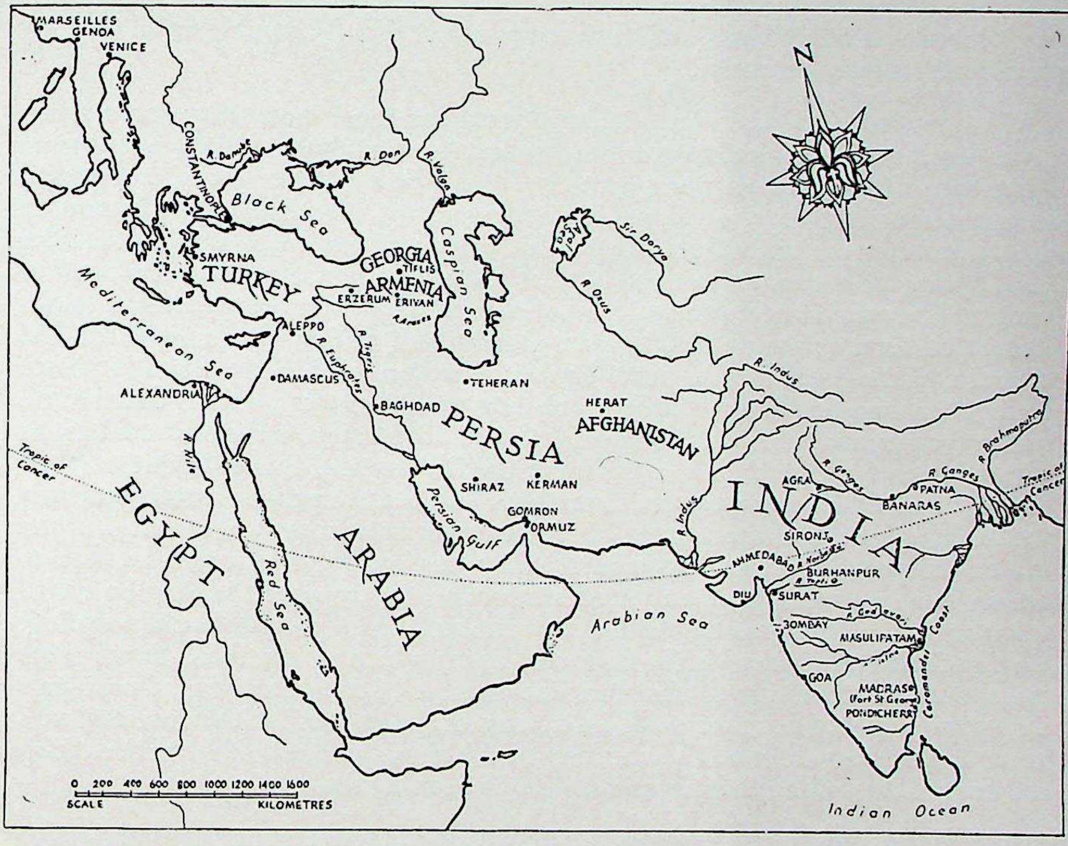


and Roques' curious but unsophisticated description accords exactly with the botanical descriptions and drawings. Roques was probably shown the tree form, and given a verbal account of its cultivation for a dye-root. The apparent inconsistencies in his description arise from the fact that the harvest of the roots is done when the plant is young, as in the case of madder.[41]

We have seen above that in the index the *saranguy* is called the *ronas* of India. The following information on the subject of this plant appears in *Les six voyages de Jean-Baptiste Tavernier*, Paris 1677, Vol. I p. 47 : " Astabat, in Armenia, is the only country in the world which produces the *ronas*, for which there is such a great demand in Persia and India. The *ronas* is a root which runs under the earth like the liquorice plant " (it is noteworthy that Roques makes the same comparison !) " and which is not much larger. It is used for making red dye, and it is this plant which gives that colour to all fabrics which come from the Empire of the Great Moghul. Although it is pulled from the earth in very long pieces, these are cut to the length of the hand, to be made up into bundles for convenience in filling the sacks in which this merchandise is transported. It is a strange sight to see the arrival at Ormuz of caravans laden entirely with this *ronas* to send to India in the ships which are returning there. This root gives a strong and rapid dye; an Indian boat laden with it was broken to pieces by negligence in the roads of Ormuz while I was there; the sea for the length of the shore where the sacks floated appeared completely red for several days." Elsewhere, the author tell us that " the *ronas*, that famous root of which I spoke in the first book of these memoirs, is almost all transported to India." (Tavernier, who was a dealer in precious stones and pearls, and son of a geographer and seller of maps, made six voyages between 1632 and 1668 to Turkey, Persia, and India; he was therefore in the latter country before Roques. The narrative is not from his pen, but was compiled by Samuel Chappuzeau, from Tavernier's notes.)

These references are very interesting, and might lead one to suppose that north-west India imported its red dye plant chiefly from neighbouring Persia, at least at the period when Tavernier was at Ormuz; which may have been in May 1652, when he embarked at Gomron (the present-day Bender Abbas) for Masulipatam. Roques, however, although quoting *ronas* among Persian exports, tells us that the dye-root in question was cultivated in the neighbourhood of Sironj and was called " the *ronas* of India."

I have sought *ronas* in the *Manuel tinctorial des plantes*, by J. P. Buc'Hoz (5th edn., considerably augmented, Paris 1800) but it is not to be found under the letter " R " in the index of the various dyeing plants. We do, however, encounter the word in an Appendix containing, with other things, a resumé of Tavernier's account of the *ronas* (reproduced above), without comment. *Le Grand Dictionnaire Universel Larousse* of 1864 gives the following definitions : " A root of Armenia, this being the common name of the madder of Smyrna." Though not quite clear, for the madder of the Levant usually bears the name *alizari*, this information confirms that the *ronas* should be discussed as a plant, and not as a tree as stated by Roques.


MARSEILLES
GENOA
VENICE
CONSTANTINOPLE
R. Danube
R. Don
R. Volga
Black Sea
Caspian Sea
Aral Sea
Sir Darya
R. Oxus
SMYRNA
TURKEY
GEORGIA
TIFLIS
ARMENIA
ERZERUM
ERIVAN
R. Araxes
Mediterranean Sea
ALEPPO
R. Euphrates
R. Tigris
DAMASCUS
TEHERAN
ALEXANDRIA
BAGHDAD
PERSIA
HERAT
AFGHANISTAN
R. Indus
R. Nile
Tropic of Cancer
EGYPT
SHIRAZ
KERMAN
GOMRON
ORMUZ
Persian Gulf
ARABIA
Red Sea
Arabian Sea
INDIA
AGRA
R. Ganges
PATNA
BANARAS
R. Brahmaputra
SIRONJ
AHMEDABAD
R. Narbada
BURHANPUR
R. Tapti
DIU
SURAT
BOMBAY
R. Godavari
MASULIPATAM
R. Kistna
Coast
Coromandel Coast
GOA
MADRAS
(Fort St George)
PONDICHERRY
Indian Ocean
N
0 200 400 600 800 1000 1200 1400 1600
SCALE
KILOMETRES

The trade in dyestuffs between Western Asia, Europe and India in the seventeenth century.

One can also cite the *Relation d'un voyage au Levant fait par ordre du roi par M. Pitton de Tournefort* (Amsterdam, 1718). The author, M. Pitton de Tournefort (1656–1708), a doctor of medicine and a botanist, returned to France after two years of absence, having travelled through Turkey, Armenia and Persian Georgia. " They send every year, to Erzerum, more than two thousand camel loads from the neighbourhood of Tiflis and from the rest of Georgia, of the root called *Boia*. From Erzerum it passes through Diarbekir, where it is used for dyeing the fabrics made there for Poland. Georgia also produces much of the same root for Hindustan, where they make the most beautiful painted cloths."[42]

Boia is the Turkish name for madder, according to the *Dictionaire bibliographique de la garance*, by J. Clouet and Jos. Depierre, Paris 1879. The same work states that this dye plant is called *runaz* in Portuguese. Perhaps the origin of the *ronas* in question is derived from this term.

The somewhat contradictory information which we have reproduced shows that many different red dye-stuffs were used in India for the partial colouration of cotton cloths, painted or printed. In the north-west of India, the Empire of the Great Moghul, the dyers were partly dependant on imports from Armenia and from Georgia ; whereas on the Coromandel Coast, notably in the kingdom of Golconda, the cultivation of a type of madder, the *chayaver*, was undoubtedly practised in former centuries.

We now come to what may be considered the most interesting information given by Roques, regarding the preparation of the cloths before printing at Ahmedabad. He discusses the operation called "oiling." The cloth is seeped in sesame oil for five days, or longer, according to the temperature of the season; then it is smeared with camel dung. This is a procedure used in India for the *plain* dyeing of cotton thread and fabric. The origin is not known; it passed to western Europe (France) probably about the middle of the 18th century,[43] and is known under the names of Indian red, Turkey red, or red of Adrianapolis. The chemism of the operation has never been clearly elucidated, and the late Professor Haller,[44] in one of the last studies published on this subject, thinks that the oil did not enter into the composition of the coloured lac, but contributed to its dispersion into the cloth. The painters of the Coromandel Coast did not oil their cloths,[45] and this is perfectly understandable because the grounds were generally white. By contrast, if the printer of Ahmedabad made mainly red grounds, the use of the procedure becomes plausible. By this means, one would be able to obtain large surfaces uniformly and very permanently dyed. It may be noted that the bath of camel dung can be fully explained as a process in plain dyeing, for the cloth is soaked with the mordant (alum) which would break down more readily on the cloth due to the ammonia-content of the excrement; the process would presumably not take place in exactly the same way if the mordant was printed in thickened form. The chemism of this dung-bath, like that of the oiling and that of the galling, has never been clarified, other than by hypothesis.

In Europe, cotton cloths dyed in Turkey red became a great vogue in calico printing, when advances in chemistry (for example, the use of chloride of lime) in the 19th century made it possible to disperse the colour from pre-determined parts of a pattern by the process called "discharge." By this means, one obtains a white, or other colours, on a red ground. In the present state of research, there is no evidence for supposing that the Indians were in possession of a technique for the decolouration of red.

The Coromandel Coast painters, according to Beaulieu (1734) and Coeurdoux (1742) knew that lime-juice destroyed mordants which had blotted places where no colour was required. Roques remains mute, most probably because a liquid mordant blots more easily on the cloth than a thickened one. But the Indians, as far as we know, did not apply this technique to the production of designs with a coloured ground on a cloth impregnated with mordant, the necessary acids being applied to the cloth in the form of a paste. In Europe the first known recipe of this kind is Swiss, dating from 1766; the "mordant consumers" (*mange-mordants*) of the calico printer Jean Ryhiner of Basle.

Roques' reference to oiling at Ahmedabad in 1678 is the earliest indication of this method at present known. However, the process differs slightly from that described by Paradis before 1748,[46] which is concerned with the three methods of plain dyeing cloths red in the region of Pondicherry. It may be useful to summarise the memoir of this author on the first method, particularly as it has remained unknown to most historians.[47]

An alkaline infusion is prepared from the ashes of a plant called in Tamil *nayourivi;* into this is put kids' dung and oil of sesame.[48] (This mixture was in former times called " animalisante " in Europe, because it was believed to make cotton even more colour-absorbent than animal fibres). The cloth is immersed in this bath, and kneaded regularly for eight days. It is then washed in water containing ashes, to extract the surplus oil. An infusion is prepared from leaves of *cacha*, (a tree containing alum), in which the cloth is soaked for one night. Next the skin or bark of the roots of a tree called *nouna*[49] by the Indians, or *nancoul* by the Portuguese, is pulverised to make an infusion in which the cloth is immersed for two days, taking on a reddish tint. Then comes the bath of *chayaver* (the madder of India), which was apparently cold; the cloth remains in it overnight and is dried during the day, the process being repeated for eight days. Then a second bath of *chayaver* is prepared, this time hot; when the water is boiling well they cease to re-fuel the fire, and leave the vessel on the wood embers for eighteen hours, stirring the cloth regularly with a stick. It is then washed and dried, and the operation is complete.

It should be noted that the procedure related by Paradis (which does not mention the galling) is much more complicated than that described by Roques, who, evidently, was primarily a merchant, and probably had only an imperfect view of the work. In fact, he does not describe a single dye-bath, and refers to the treatment of the cloth with the vegetable astringent—which could not of itself impart any colour—as " the first application of dye." But the important fact is that the oiling did not escape his notice.

Roques lays great emphasis on the properties of the water at Ahmedabad, and in other localities, as a very important factor in the successful preparation of the chintzes. Similarly, in France, the Abbé Mazéas in his *Mémoire sur le rouge des Indes* of 1757 (*cf*. Bull. Soc. Ind. de Mulh., 1/1966, page 26, note 2) surmised that the presence of calcium is an essential ingredient for obtaining a fast red. In fact, the insoluble coloured lac which forms on the fibre of the cloth is composed of three elements; the alizarin, derived from the madder; the aluminium, from the alum or from the *cacha* leaves; and the calcium, which might be provided from the water used, or from the plant having grown on a soil rich in calcium (which accounts for the difference in quality of the various madders); it might again be provided by the man who adds chalk to the dye bath, if neither the water nor the plant are calcareous. This last operation does not appear to have been practised until the last quarter of the 18th century, and then only in Europe, in factories situated on the banks of rivers where the water was particularly pure. There is no evidence to show that this method was ever practised in the past by the Indian artisans to improve the quality of their dyes. Undoubtedly they did not know why some waters were effective, while others gave disappointing results.

In conclusion, it remains only to speak of the quality of the chintz printed at Ahmedabad. Since no example appears to have survived from the period under survey, it is impossible to give an account of the type of work produced. Were they, or were they not, as beautiful as the painted cottons of the Coromandel Coast? It is difficult to know, for several voyagers of the 17th century lay great emphasis on the fact that the printed cottons of India were generally inferior to the painted ones.[50] One may suppose that they were often badly printed by a harassed workman, who adjusted his blocks carelessly, a fault which obviously would not occur on a cloth where the design had been meticulously painted. But one might also think that the colour quality, for some technical reason, could not rival the beauty of the painted cloths. In fact, alum is not an ideal mordant. As it dries on the cloth (whether or not this has been impregnated with oil), it has to deposit a certain quantity of aluminium, which will condition the success of the dye. Painted in an aqueous solution, the result is satisfactory, but the problem changes when it is printed with a thickening. This is why, in Europe, research was undertaken to seek another mordant, culminating in the discovery, probably in the second quarter of the 18th century, of the use of acetate of aluminium by transformation of the alum with the aid of salts of lead. This new product deposited a maximum of metal on the cotton fibre; it remained the ideal mordant for red, and was used by calico printers throughout the 18th and 19th centuries; the thickening, nevertheless, remained a veritable art.

The manufacturer Jean Ryhiner of Basle, in his *Traité* of 1776 (*cf.* Note 4) gives an analysis of Indian cotton painting techniques on the Coromandel Coast, derived from the accounts of Beaulieu and Coeurdoux (*cf.* Note 2), the only ones known to the public at that period. He states that in India, only alum was used. " Whereas the dyers can use the mordant without admixture, we are obliged, in order to thicken it, to blend it with a foreign body. Thus we see that the dyed cloths are always more vivid, because the pure mordants of the dyes operate better than the printed mordants which are mixed with foreign matter. There is no remedy for this, it is a necessary evil; it is only a question of choosing the least harmful mixture."

The fastness of the colours depends of course on the dyeing properties of the roots utilized. In one place imported *ronas* (madder-like plants) could have been employed, and in another district, the Indian *saranguy* or *al*. On the Coromandel Coast, the *chayaver* was used. This accounts for the high reputation of some provenances for colour and less favourable reports from other areas.

To resolve the question of the relative quality of the Ahmedabad prints and the painted cottons of the Coromandel Coast in 1658, one would obviously need to be in possession of pieces whose dates and places of origin could be established beyond doubt. So far as we are aware, no surviving prints of this period are available.

Thus until new evidence is available, we have no means of knowing just what is meant by the *jafracanis* of two or three colours, and the *pancheranguis* of five colours, and other pieces which Roques commissioned mainly for the home market; and which would have disappeared from the legal French market a few years later, after the prohibition of imports of chintz decreed by Louis XIV on the 26th October 1686. There is, moreover, no mention of this ban in the portion of the manuscript dated later than 1678.

NOTES

[1] Madame Krishna Riboud, of Paris, a member of the Comité du Centre International d'Etude des Textiles anciens (C.I.E.T.A.) of Lyons, who owns a fine collection of Indian textiles, was in conversation with Professor Sen, the Bengali historian, who has done considerable research on the Compagnie francaise des Indes and has written two books on that institution. He sent her a list of documents for consultation in the Parisian archives. Among them was an item in the Bibliothèque Nationale described in the following manner: A Ms. La manière de negocier dans les Indes Orientales, without author or date, written perhaps at the beginning of the 18th century." Professor Sen had not personally examined this Ms.

Mr. John Irwin, Keeper of the Indian Section of the Victoria and Albert Museum, London, and historian of the textile trade of the English East India Company in the 17th century, extracted from this list, during a brief visit to Paris in October 1965, a few titles for consultation at the Bibliothèque Nationale. He found nothing of interest to his personal research until he arrived at the last manuscript on his list, which bore the title quoted above. He found, to his surprise, that the document both signed and dated. The person who had notified the Ms. had not seen this. Pressed for time, he noted quickly from the index the chapters relating to fabric printing in India in 1678, and notified me of its exceptional importance, asking me to make a complete examination ; which I made in November 1965. Nothing in the title suggested such a discovery. Four photocopies of the Ms. were made by the Bibliothèque Nationale, and sent to Madame Krishna Riboud ; to the Victoria and Albert Museum in London ; to the Royal Ontario Museum at Toronto, Canada ; and to the Musée de l'Impression sur Etoffes at Mulhouse. Madame Riboud undertook to transcribe and cyclostyle the text in modern orthography. My work amounts to the reproduction of the chapters devoted to printing on cotton at Ahmedabad, which throw new light on the history of the partial coloration of fabrics, the object of my studies.

[2] The account of the Dutchman Daniel Havart, datable to about 1680 but not published until 1693. In the present state of research, it is the oldest known account of the fabrication of *painted* cloths in India. It relates to Palakollu, to the north-east of Masulipatam. That of his compatriot Hendrick Adrian van Rheede, which appeared in 1688, reports on Pulicat, to the north of Madras; but the technical information is obscure in both accounts. The first description which leaves nothing to be desired comes from Pondicherry, in 1734, and is that of M. de Beaulieu, a French naval officer. His Ms. and the samples which accompanied it are reproduced in the *Bull. de la Soc. Ind. de Mulh.*, No. IV/1957 (translated in *J.I.T.H.* No. II, 1956). Next came the well-known letters of Father Coeurdoux, in 1742 and 1747, also from Pondicherry (translated in *J.I.T.H.* No. III, 1957); and later still the work of the celebrated English botanist William Roxburgh, which appeared in London in 1795, and which I have reproduced with commentary in *J.I.T.H.* No. IV, 1959.

[3] An anonymous article appearing in the *Journal économique de Paris*, in July 1752, described in a very confused manner the method of printing in India. It affirms that only the outlines of the design were printed, with the use of a sort of ink made from pulverized indigo diluted in oil of aspic; the main surfaces were always painted. It was apparently the only information available on this subject before the discovery of the Roques Ms. None of the travellers of former times who mentioned the manufacture of printed cloth in India had given any information on precise techniques, at least in those accounts which have been published. (*Cf.* my study on chintz, *Bull. de Soc. Ind. de Mulh.*, No. IV/1962, and the fundamental research of John Irwin in *J.I.T.H.*, Nos. I, 1955 ; II, 1956; III, 1957; and IV, 1959).

[4] The Basle manufacturer Jean Ryhiner, in his *Traité sur la fabrication et le commerce des toiles peintes* of 1766, a Ms. preserved in the Bibliothèque de la Société Industrielle de Mulhouse, the celebrated Edward Bancroft, in his *Experimental researches on the philosophy of permanent colours*, London 1794 (2nd edn. 1813), and the eminent colour chemist Daniel Dollfus-Ausset of Mulhouse, in his *Matériaux pour la coloration des étoffes*, Paris 1865, all state categorically that in India, they only made cloths which were painted.

[5] Born 4-11-1620 at Marseilles, died 14-5-1683; in the French consulate at Aleppo in 1661; envoy to Surat in 1670; returned there from Masulipatam 26-8-1675.—Kaeppelin, *op. cit.*

[6] Summary of pages 291 and 292 (in the series on the English East India Company): the late king Charles II had married the Infanta of Portugal, who had brought him Bombay, and the Queen Dowager could sell the town or dispose of it as she wished. We do not know what his successor, James II, intended. He looked after the Company's interests more than anyone, but got no thanks for it; there was rejoicing in India at the news of rebellion in England. But God protects good kings, and traitors are punished in the end. Several ships were wrecked on the coast in a storm, while others caught fire, and by May 1691 all the people concerned, agents in different parts of India, nine in number, found their affairs in great disorder.

It may be noted here that James II succeeded his brother Charles II on the latter's death in 1685, and reigned until his abdication on 22-1-1689, the year in which his son-in-law, William of Orange, succeeded him, reigning until 1702. Yet the author of the manuscript does not breathe a word of this when he relates the events of 1691 and mentions James II. At a period when communications were slow one can envisage that the change of monarchs which had come about in England remained unknown to him for years. . .

[7] After page 214, one finds only general information about the Moors; the *serafs* or money agents; the Armenians; the trade with Persia (pearls, diamonds, wools); the exports of India to Persia; the Portuguese in India; the English, Dutch, Danish and French companies.

[8] *Chitte* is equivalent to the English term *chint*, (plural, *chints*, *chintz*) of which the etymology is open to discussion. Earlier authorities, including the Oxford English Dictionary and Hobson-Jobson (glossary of colloquial Anglo-Indian words published in 1903) give the Sanskrit *chitra*, 'variegated, speckled.' Recent research suggests a vernacular, non-Aryan root *chitta*, 'spotted cloth.' Sir Ralph Turner, *Comparative dictionary of the Indo-Aryan language*, fasc. IV, London 1962, p. 276.

[9] Roques devotes a chapter to the bleaching of cloths destined for sale as white goods.

[10] This "second tanning" is not very clear. The cloth had undergone a first treatment with a substance for "tanning," the myrobalan; it may be a question of repeating this operation.

[11] It is necessary to thicken the liquid mordant in order to print with it.

[12] In Europe, four small metal pin-points were placed in a rectangle as guide marks, which enabled the printer to place the block successively in the right position, whatever its shape might be. Roques' statement suggests that the blocks he describes should, as a rule, be square.

[13] This passage is not quite clear. One would trace a horizontal line which would serve to guide the printer in placing his block. In Europe, the "trace" was a line parallel to the selvage of the cloth, on which the printer took his bearings when he began work at a table.

[14] Obviously a block is not made to "glide"; it is applied to the cloth. If a roller had been used, it could have been described as "gliding," but this is not the technique referred to here.

[15] He means the block for the small details.

[16] *Pancherangui* means "five colours." Roques specifies this elsewhere in his work.

[17] Mr. John Irwin thinks that *jafracanis* are a particular style of cotton print named after Ja'far Khan who was appointed Prime Minister by the Emperor Aurangzib about the year 1662, and died in 1670. Ja'far Khan is said to have been especially interested in textiles and prided his reputation as a connoisseur (stories to this effect being mentioned in the *Maathir-ul-umara* by Nawab Samsam-ud-daula Sha Nawaz Khan).

Le Dictionaire Universel de Commerce of Savary (1657–1716), a posthumous work published for the first time in 1723, reproduces a "general statement of all the merchandise in which trade is done at Marseilles in 1688." One finds there among other things, *indiennes Jafarcanis* (chintzes Jafarcanis) imported from Aleppo. In fact, despite the prohibition of 26-10-1686, they could enter by Marseilles by virtue of an ancient privilege, as these "painted cloths" had come directly from the Levant; and they were sold in all the territory of the town. This work also informs us that there were "*indiennes Chaferquanis*" (chintzes Chaferquanis) which came from Persia, and that "the Armenians who made the voyage from Aleppo to Smyrna often brought chintzes which they called *Chaferquanis*."

[18] These are the French, the English and the Dutch.

[19] The madder bath was boiling, and certain of the ingredients, if carelessly used, could impair the cloth in the course of other operations.

[20] The green could not conveniently be dyed, nor could it be applied directly, for want of suitable dyestuffs. To obtain it, one had to put yellow over the blue; the cloth would be almost finished before undergoing this last operation.

[21] This custom of making " imprints " on paper is thus very ancient.

[22] A courge comprised 20 pieces of cloth.

[23] The copperas is a sulphate of iron which becomes black in contact with a vegetable astringent such as myrobalan, which contains tannin.

[24] The preparation was generally a rice paste, which it was necessary to remove. As the cloth was to be painted or printed, it would have been useless to bleach it totally, as if it were to be sold white. Moreover, a re-bleaching finished all chintzes with a white ground.

[25] See the ensuing section on the examination of Roques' text, which explains the meaning of the operations.

[26] *Cf.* Note 20 above.

[27] To be read, without doubt, as " *de l'ocre* " (of ochre).

[28] Members of a sect of Gujarat attached to the cult of Vishnu. The *banians* did business everywhere, from China to Zanzibar; they were called " the Jews of India." Roques devotes many pages to them.

[29] *Cf. Bull. Soc. Ind. de Mulh.*, Nos. IV/1957 and IV/1958.

[30] This term dates from the first Portuguese voyagers who explored India at the end of the 15th and beginning of the 16th centuries. It may be interpreted in two ways; " painted," from the past participle of the verb *pintar*, to paint; or " speckled; spotted " from the adjective *pintado*, which has also given its name to the bird *pintada* (guinea fowl), in the same sense as the Sanskrit *chitra* (see note 8 above).

[31] The wax was used to protect (" reserve " being the classical term) those places which were to remain white, whether in the indigo vat for dyeing blue, or in the madder bath for dyeing with the mordants. Its melting point was above the temperature of the indigo vat, and it was removed with hot water after the dyeing in blue. In the case of the maddering with mordants, one began by drawing fine lines with the wax, using a special pen or printing with a block of wood; when the mordants were applied over this, they would hold only on the unprotected parts of the cloth. After the fixing of the mordants, the protective coating of wax was removed by scraping before the dyeing of the cloth; or by melting; for the dye-bath was boiling. The size of the surface to be protected generally determined the method to be used. At the time of the maddering, the desired colours appeared simultaneously, rather like the development of a photograph in colour.

A letter from Surat, dated 1634, in the archives of the East India Company, reproduced by John Irwin (see note 3), mentions another process for the reserve, giving a product " similar to that of the beautiful paintings of Masulipatam." The cloths were placed in as many colouring vats (cold or tepid, apparently) as the number of shades desired, the places not to be dyed being covered with a sort of earth. It seems this is the only information of this nature which we possess. The complete absence of technical information does not permit us to reconstruct an account of the method as operated in reality. No sample of such work seems to have survived; it is therefore impossible to know whether it could really be compared with the beautiful paintings of Masulipatam.

[32] *Cf.* John Irwin, *J.I.T.H.*, No. I, 1955.

[33] Oil of gingely, or *gergelin* according to the Portuguese term, is none other than oil of sesame.

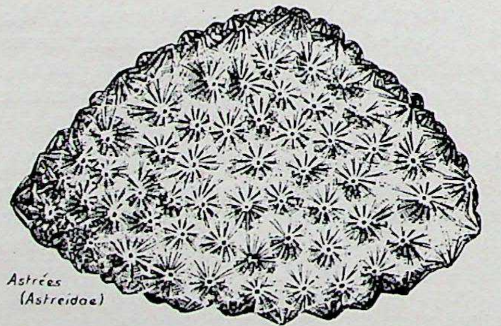
[34] The indigo used commercially is insoluble. To be used as a dye, it must be reduced to the state of white indigo, which is soluble in an alkaline lye. On taking the cloth from the vat, the white indigo reverts to insoluble blue on oxidising in the air.

[35] Campeachy wood (logwood) does not give a red, but a black or a grey with the iron mordant, and a violet with the aluminium mordant (alum). Brazil wood gives a red with the aluminium mordant and a brown with a mixture of the iron and aluminium mordants. Brazil wood and sappan wood are both from the *Caesalpinis* (*brasiliensis* and *sappan*); the colours which they produce on cotton are not very fast.

If Roques discusses only fabrics of wool and silk when speaking of dyeing in France, it is because he is concerned with the textile fibres most in use there at that period.

[36] At Page 42 of his manuscript, Roques, speaking of the natives, tells us that " *leur divaly est le premier jour de l'an* " (their *divali* is the first day of the year). The Hindu new year, which is fixed astronomically, begins in mid-October.

[37] This word is obviously an error by the copyist on material unfamiliar to him. *Atier* (*batier*, *bastier*) is a type of turning-spit used for roasting, in cooking by an open fire-place, as practised in Europe in the 17th century. There are two possibilities for the correct version, both of which give a vivid description of this unusual fruit, as our drawing shows. It must be borne in mind that Roques was not a botanist or biologist, and also that many of the *botanical and biological* terms were not allocated until much later stages in research into oriental flora and fauna, in the eighteenth and nineteenth centuries. We offer the possibilities, however, because many botanical and biological names did, in fact, develop from the very apt popular descriptions given by the travellers who first noticed the species, but had no scientific background to do more than record what they saw. The strongest possibility for Roques' original version is *astrées*, or in subsequent biological terminology *astréide*, a type of coral of the family *astreidae* (see *La Grande Encyclopedie*, Paris, 1887-1902, Tom. IV, ASTREES ou ASTREIDES). This coral could quite reasonably have been fairly familiar to anyone who had made the journey to the East, but would not be widely known at home. Another possibility is that Roques meant *aster*, a flower well known in Europe; the name also applies to less well-known minor species, including the little plant known in English as "starwort". The small flowers of this plant are, to a non-expert observer, not unlike the little flowers which continue to appear on the developing fruit of *morinda citrifolia ;* the name *aster* (as, indeed, *astrée*) means simply " star-like."



[38] A letter from Bombay, of the 9th March 1875, from A. J. Wuttleworth, a forestry official, states : " The only madders known in the Northern division of this Presidency are several species of morinda, known under the name of *Al*, the root being called *ach;—Rubia munjista*, of which the indigenous name is *munjeet*." (Aug. Besse, Avignon 1876, " *Essais d'amélioration de la culture de la garance*." p. 62). Wuttleworth, who was not an expert in dyeing terminology, appears to be using the word " madder " only to describe a red dye. He was somewhat confused about the whole subject. *Rubia munjista* (*munjeet*) is quite a different dye-plant, though it is also used for a red dye, as substitute for madder. Probably, like Roques, he obtained his information from native dyers, but through imperfect understanding of both language and technicalities, failed to record it precisely.

[39] The accounts arising from official surveys of cotton dyeing and cotton printing in various parts of India, published in the *Journal of Indian Art*, include many references to the root, and descriptions of the method of use.

See C. W. Ravenshaw, " Report on cloth-stamping and dyeing in Beawar ", *Journal of Indian Art*, Vol. II, no. 17, 1887, pages 5 to 8, and T. Holbein Hendley, " The arts and manufactures of Ajmere-Merwerra ", *Journal of Indian Art*, Vol. III, No. 26, 1889, pages 5 to 9. A most interesting reference to the use of the bark of the roots of *Morinda citrifolia* in the Kistna District in South India occurs in E. B. Havell, " The industries of Madras ", *Journal of Indian Art*, Vol. III, No. 27, 1889, pages 9 to 16, where he describes the root, known in that area as *chiranjee*, as being mixed with the roots of the more expensive *seruver* for the poorer class of work. A report called " Dyeing and printing in general ", prepared under the direction of Dr. John Forbes Watson in connection with the *Collection of Specimens and Illustrations of the Textile Manufactures of India* (*Second Series*), 1887, in the Library of the Asiatic Society of Bombay (typescript copy in the Library of the Calico Museum), gives the following account :

" MORINDA or A'L. This root is well known on this side of India by the name of *surangi* or *a'l*. Several distinct species of morinda yield this root. *Morinda citrifolia* and *Morinda multiflora* are extensively cultivated in this Presidency ; the former in Khandesh, Berar and the Deccan, and the latter near Nagpur ; while *Morinda tinctoria* in the northern parts of Gujarat. All of them are small trees, bearing dense heads of flowers and fleshy fruits. The plants are allowed to remain two or three years in the ground before the roots are taken up and dried. There are other species of morinda whose roots yield colouring matters, but they are inferior to the species named above, and are not sold in the Indian market. *Surangi* or morinda roots, as known in the Bombay market, are of three sorts : (1) *Gujarati*, or the thin sort. Probably the root of *M. tinctoria* ; it yields the best red dye and is preferred to the roots of the other species. It fetches Rs. 4½ per maund. Pieces 3—5" long, of the thickness of a crow-quill, externally of a greyish colour. (2) *Ghati*, or the thick sort. (3) *Malabari*, or the mixed sort."

40 The Morinda are described as erect or climbing trees or shrubs, of which there are about 40 species, common to the tropics of both hemispheres. They are of the order *Rubiaceae*. Descriptions of the main types are given in Dietrich Brandis, *Indian trees, an account of trees, shrubs, woody creepers, bamboos and palms indigenous or commonly cultivated in the British Indian Empire*, London, 1906, p. 392 et seq.

Roxburgh's study of the species revealed that the roots of most were able to yield a red dye, but the *Morinda citrifolia* was the most widely used for this purpose. Linnaeus' nomenclature, at that period, covered this type of Morinda broadly, and Roxburgh made further sub-divisions, distinguishing one which he named *Morinda tinctoria*. He describes *Morinda citrifolia* as " . . . An elegant small tree, with straight trunk, and numerous, decussated, assurgent branches, a position they generally take from the weight of the fruit, and constant exuberant foliage. From Pegu it has been introduced into the Botanic garden at Calcutta, where it is in constant fruit, and flower, the whole year. It does not appear to be a native of Bengal, nor did I ever meet with it on the coast of Coromandel ; but the species which I formerly considered as *citrifolia* is common in both countries, and the description and drawings thereof were sent to the Honourable the Court of Directors. That species, which however is quite distinct, I now call *tinctoria*, as it is the sort most in use for dyeing." (William Roxburgh, *Flora Indica*, completed and edited by Carey after Roxburgh's death, published at Serampore, India, 1824, pages 196-204, Morinda.) Describing *Morinda tinctoria*, Roxburgh says " . . . this small tree I found pretty common in every part of India, where I have been. It is in flower and fruit the most part, if not the whole of the year . . . the bark of the roots is used to dye red, the colour is fixed with alum, but it is neither bright nor durable. In some parts of India it is cultivated for the sake of the roots ; see *Asiat. Res.* iv. In the Circars the dyers use the bark of the fresh roots bruised and gently boiled in water for a long time, the cloth is prepared in a cold infusion of the powdered gall of Terminalia Chebula, in milk and water ; it is then dried and moistened with alum water, and again dried, and receives from the above decoction, a pretty bright, but fugitive red." Roxburgh's assertion that the red was a fugitive colour is interesting. He may not have seen the best methods of use ; but it is also possible that Roques over-estimated the permanence of the colour, or that his description is only relative with sappan-wood and campeachy-wood in mind.

In the course of correspondence while our research was in progress, Monsieur Schwartz made some most valuable points concerning the caution with which the early botanical accounts and early accounts of dyeing processes must be viewed, and with his permission, these observations are now made available to our readers :

Botanical researches are very puzzling indeed ! In my note " Les toiles peintes indiennes " (*Bull.* SIM IV-1962), comparing the chintz and the batik fabrication I put " *mengkoudou — morinda* *citrifolia,*" taking this from Louis DRIESSEN, the Dutch printer who studied chemistry in our town [Mulhouse, France], who went twice to Java and made the sensational discovery that the Javanese *did* use aluminium for the red as the rind of the *djirak* they use contains aluminium. Same with the leaves of the *casha* (*Memecylon tinctorium*) employed on the Coromandel Coast (*Bull. Soc. Ind. Mulh.*, June 1902). *Mengkoudou*, also written *mankoudou* gives red, my greatgrandfather studied it under the name *Ouonghoudou*, together with *chay*, *mungeet*, *cassa* and other Indian plants, but no Latin names are mentioned (*Bull. Soc. Ind. Mulhouse*, 1832 No. 23).

My Encyclopaedic English-German and German-English MURET-SANDERS, 1900, gives *Morinda citrifolia* — Indian mulberry, the same indication in the famous PERSOZ treatise of 1864, giving as dyeing principle carthamine and not alizarine !

The *Manuel tinctorial des plantes*, Paris 1800, gives for red *Morinda Umbellata*, and mentions only Indonesia, big exports from Moluques and Amboine to Java. *Morinda citrifolia*, enumerated on one line you find " Muncudu, bencudu, lakki, morinda." Its roots give a very fine red. Found in Java, Malacca, the Molaques Islands."— this leaves the impression that *mankoudou* is *Morinda citrifolia* as Driessen said, being used in Indonesia.

In these botanical affairs it is very difficult to see clearly. For instance, the *soga* used for the Batik fabrication is called " peltophorum pterocarpum " but also " ferrugineum," which indicates the presence of iron, a very important factor.

The well-known French *Dictionnaire universel* LAROUSSE (old and new editions) tells us that the Morinda (*Rubiaceae*) comprises dozens of sorts. The *umbellata* grows up to two or three metres ; its roots are employed for dyeing black or yellow (sic !) The *citrifolia* has a medical use.

[41] It is of interest that indigo, too, if allowed to develop normally, is a bush or a shrub. When cultivated as a dye-stuff, it is gathered as a very young plant, ideally at the first appearance of flowers, a few months after sowing. It was normal practise to take two or even three harvests during the year, when the plant had re-grown after the cutting of the leaves at the first harvest, but there was a deterioration in the quality of the dye-stuff after the first harvest, and the later crops were normally reserved for the cheaper grades of the dye. A new sowing of indigo was made each year.

[42] There were at this period a Turkish Armenia (capital Erzerum), and a Turkish Georgia, composed of three countries tributary to the Great Sultan. Diurbequis (Diarbekir) was in the Turkish province of Algezira. The capital of Persian Armenia was Erivan, and of Persian Georgia, Tiflis. Tavernier places Astabat in Turkish Armenia, at the frontier of Persia, at one league (4.4 km.) from the river Aras (Araxe). The locality also produce a famous wine.

[43] Robert Forrer, in his well-known work '*Die Kunst des Zeugdrucks vom Mittelalter bis zur Empirezeit*,' Strassburg, 1900, (a work unfortunately not free from grave errors), tells us that Neuhofer had obtained, in 1693, a licence from the Magistrate of Ausgburg (in south Germany) for the dyeing of *Turkey* red. (This calico printer had introduced into that town the Indian method, which he had learned in England and Holland). In reality, just as I supposed, the document in question speaks only of simple dyeing in red (*Rotfärben*). (Kindly verified by one of our New York correspondents, Jacques J. Whitfield, author of a book on the German calico printer Schulé; in 1966 he investigated the archives of that town). Forrer, unfamiliar with technical questions, cannot be cited except after careful verification of his sources, if one wishes to avoid false conclusions.

[44] *Cf.* '*Mailliand Textilberichte*,' Heidelberg, Nos. 5, 6, 7, 9, 10, 1938. The best study of the ancient history of dyeing in Turkey red is that of Théodore Château, colour chemist, which appeared in nine of the twelve monthly parts of the " Moniteur Scientifique " of Dr. Quesneville, of the year 1876. The author makes the excusable error of believing that one could dye it without alum, in India, for at the period when he wrote, it was not yet known that the leaves of *cacha*, which were used, contained aluminium. (Discovered by Louis Driessen, *Bull. Soc. Ind. de Mulh*, June 1902). (*Cf. Bull Soc. Ind. de Mulh.*, No. IV/1958).

[45] They did not " oil " in the true sense, but prepared the cloth with an aqueous solution of buffalo milk and vegetable astringent. The object, the craftsman said, was to prevent the

mordant from " running " on the cloth at the time he painted. But one must admit that this treatment with a fatty substance had also a beneficial influence on the generation of the colours.

It should be noted that he did not use animal dungs except for their cleansing properties; he included them in the preparation of the baths which removed the traces left by the madder on the unmordanted parts of the cloth.

46 Reproduced by Father Coeurdoux at Pondicherry, 13-10-1748, but not published until Volume XXVIII of the *Lettres Edifiantes* in 1758. Paradis, born about 1701, a distinguished engineer, was dispatched by the Compagnie des Indes, and arrived at Pondicherry in September 1737; he commanded the French troops at the seige of Madras, held by the English, and was killed by them during the siege of Pondicherry on the 13th September 1748 (the siege was raised on the 30th of the same month). His report is therefore anterior to this date. He had communicated it to Father Coeurdoux, and retouched it on the reflections made by the latter.

47 The second red is obtained in a manner analogous to that used by the painters of the Coromandel Coast; the cloth is soaked in a vegetable astringent, then rubbed with a solution of alum, and then plunged into a boiling bath of chayaver.

The third red, very imperfect, had for its base a vegetable astringent, a decoction of sappan wood and alum. It should be noted that it was after the withdrawal from the dye-bath that the cloth was plunged in the solution of alum, a method opposite to the former one. The procedure gave a dye " which came away in the wash, and evaporated in the sun."

48 It should be noted that in the Indonesian method of *batik* (using reserves of wax), the origin of which is at present unknown, the cloth is also prepared with an infusion of ashes mixed with oil (usually castor oil), but the bath of dung is omitted.

49 Also *nona, noona.*

50 *Le Dictionaire* of Savary, already quoted, explains thus : " There were two sorts, the one painted with the brush, the other only printed. Although the same colours are used for the two kinds of cloth, those which are painted with the brush far surpass the others." " Of painted cloths, there are some printed with blocks, and some painted with the brush. Those from the paintbrush are infinitely more beautiful than the others. One brings fewer of these to Europe, than of the printed ones (*sic*). All, in general, are known as *chittes*." Tavernier, to whom I have already referred, tells us this : " I left Gomron for Masulipatam on the 11th May 1652, and embarked on a large vessel of the King of Golconda, which comes every year to Persia with a cargo of fine cloths and *chittes* or painted cloths, in which the flowers are painted with a brush, which makes them more beautiful and more expressive than block-printed cloths. . . . Sironj is a large town . . . a flourishing trade is carried on there in all kinds of painted cloths called *chittes*, which are worn by all the common people of Persia and Turkey. . . . A river flows there, the water of which has the property of making these colours so vivid, and during the rainy season, which lasts for four months, the workmen print their cloths according to the patterns which foreign merchants have given them. . . . The *chittes* or painted cloths called *Calmendar*—that is to say, painted with a brush—are made in the kingdom of Golconda, and particularly in the neighbourhood of Masulipatam, but so few are made that if you were to engage all the workmen who are skilled in the manufacture of these cloths, they would hardly produce enough for three bales [one bale=200 pieces ?]. All the *chittes* which are made in the Empire of the Grand Mughal are printed and of varying quality, both in the standard of printing and the fineness of fabric. The coarsest, and consequently the cheapest of all are made at Lahore. . . . Of the chintzes made at Sironj, a corge [20 pieces] sells at from 20 to 50 rupees and upwards."

Note the persistent confusion between painted and printed cloths, which does not facilitate the interpretation of the text. The "painted" cloths of Sironj clothed all the common people of Persia and Turkey, yet they could only have been of ordinary quality, probably " printed "; which confirms the affirmation that " all the *chittes* " of the Empire of the Great Moghul are printed. Roques tell us that the importance of Sironj came from the 400 houses of " painters " he found there, yet he himself speaks only of printed cloths . . .

In the present state of research, it is difficult to know whether, at the period in question (the second half of the 17th century), in the north-west of India and particularly at Sironj, they practised simultaneously both painting and printing, or only printing.

APPENDIX I

DIMENSIONS OF COTTON CLOTHS

Roques gives us valuable indications concerning the dimensions of the cotton cloths supplied for printing or used plain white.

The basis is the *tassou*, one *aune* (aune of Paris — 1.188 m) making 42 *tassous*. The *tassou* therefore corresponds to 2.8286 cm.

The *cobe* (*covida*, *coudée*) of which he makes use is 24 *tassous*, which is 67.8864 cm. There is also a *cobe royale* of Agra, which has 6 *tassous* more, being 30 *tassous*, or 84.858 cm.

The length of the pieces varied from 12½ *cobes* to 45 *cobes* (8 m. 4858 to 30 m. 5489). A woman of South India can clothe herself with 12½ *cobes*. For printing, the long pieces were cut into pieces.

The threads of the warp are counted by *vissas* of 160 threads. The following information gives the widths : " In all the country of Hindustan and Gujarat, the cloths bear only three names, known as *dorgagis*, *sannagagis* and *baffetas*, both fine and coarse are thus named; those which are called *dorgagis* should be one *cobe* and a half in width (101.829 cm.), the *sannagagis* one *cobe* and a quarter (84.858 cm.) and the *baffetas* one *cobe* exactly (67.8864 cm.), which is of 24 *tassous*; it needs 42 of these for one *aune*, but all these ordinances have been corrupted by the lack of established law and order in India, and differences are made of more than one and two *tassous* less in width, and of half a *cobe* or more in the length." To tell the truth, this text is not clear, for Roques lists more than 20 other cloths, of which the true names are partially known. We do not know the meaning of *dorgagis* and *sannagagis*. By contrast, the word *bafta*, which means " woven " in Persian, means an ordinary white cloth, originating at first in Gujarat, then imitated elsewhere in India, after the great famine of 1630 which had struck that province. The English bought " wide *baftas* " of 14 × 1 yard, and "narrows" of 14 × ¾ yard (John Irwin, *J.I.T.H.* I, 1955) (1 yard=0.914 m. ¾ yard=0.6855 m.).

The author reproduces his nomenclature at two places of his manuscript. In the present state of research, it needs clarification and cross-checking.

In France and Switzerland, notably, the current printed pieces of indigenous manufacture were in general of 15 to 16 *aunes* of Paris, and ¾ *aune* in width (17.82 to 19.008 m., and 0.891 m.) This would correspond to about 26 to 28 *cobes* (17.650 m. to 19.008 m.) and 1 *cobe* and a quarter (0.8485 m.).

APPENDIX II

INDEX OF SUBJECTS CONTAINED IN THE ROQUES MANUSCRIPT

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Footnote to the Index

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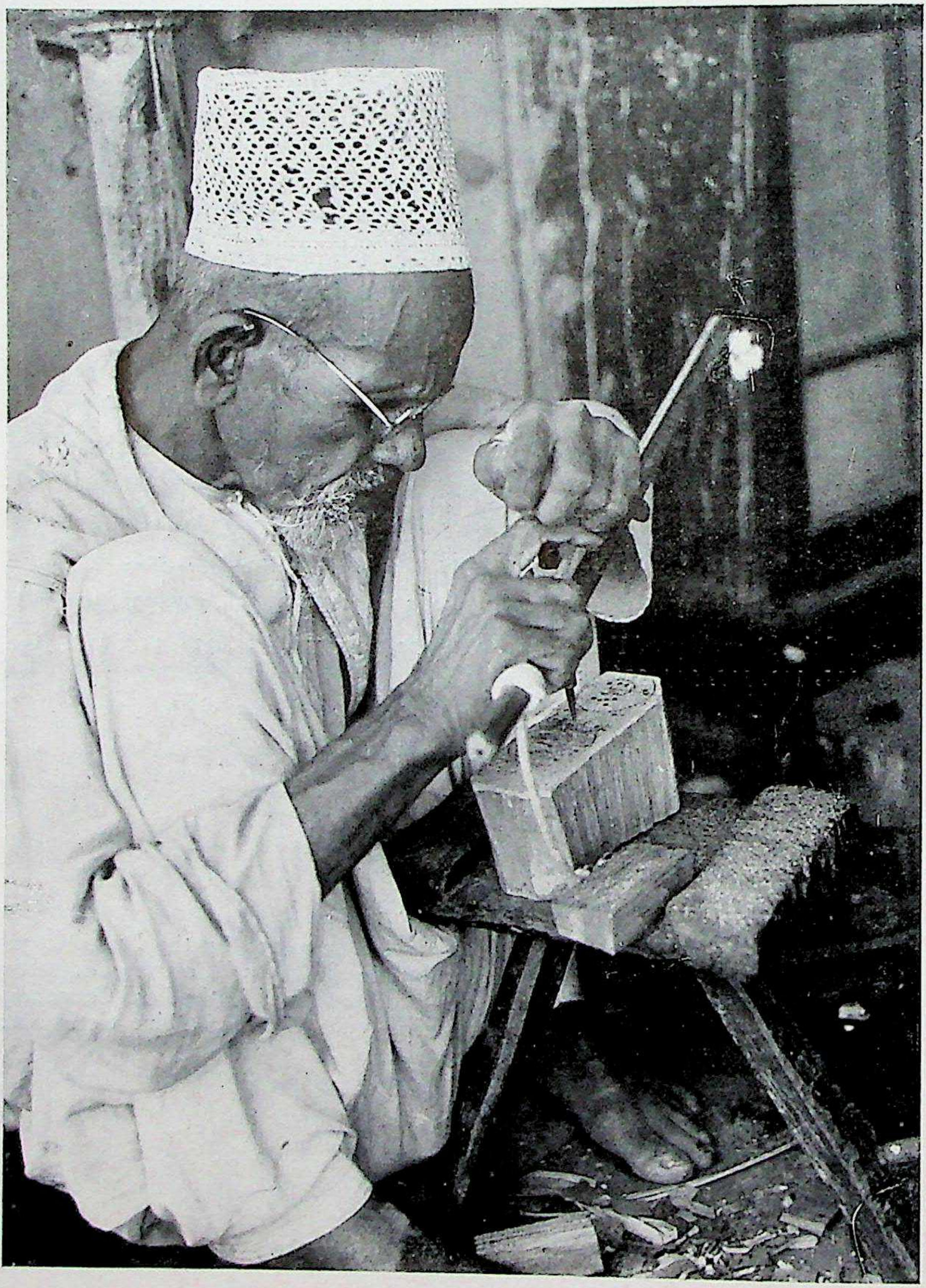
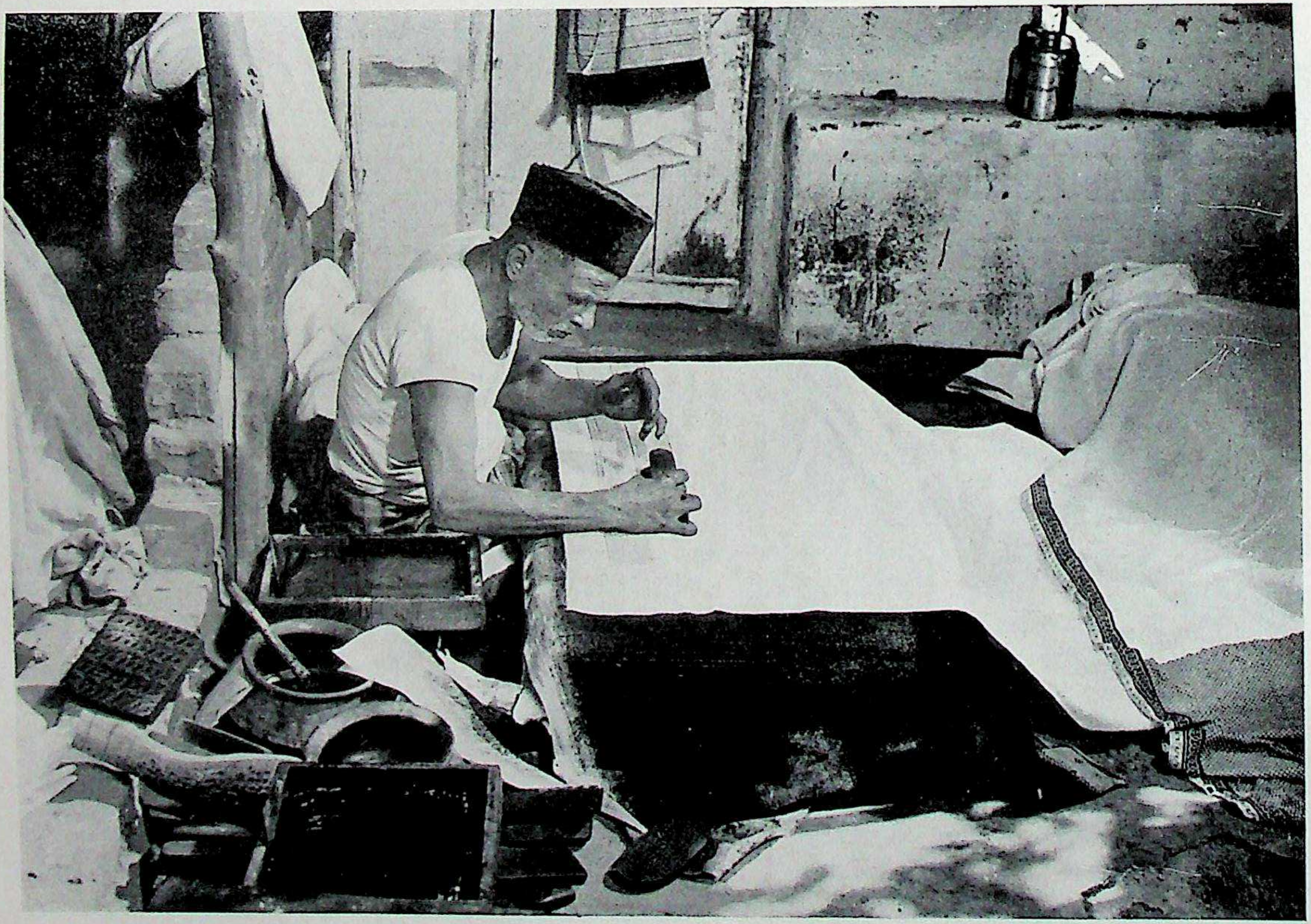
Roques tells us here of the curious method employed by the Dutch to procure indigo cheaply. They had their cloths dyed in the blue with a strong overcharge of colouring matter. Then when the merchandise arrived in the Low Countries, they would remove some of this by a boiling wash. The light blue cloths obtained (from the residue) were sold in Germany.



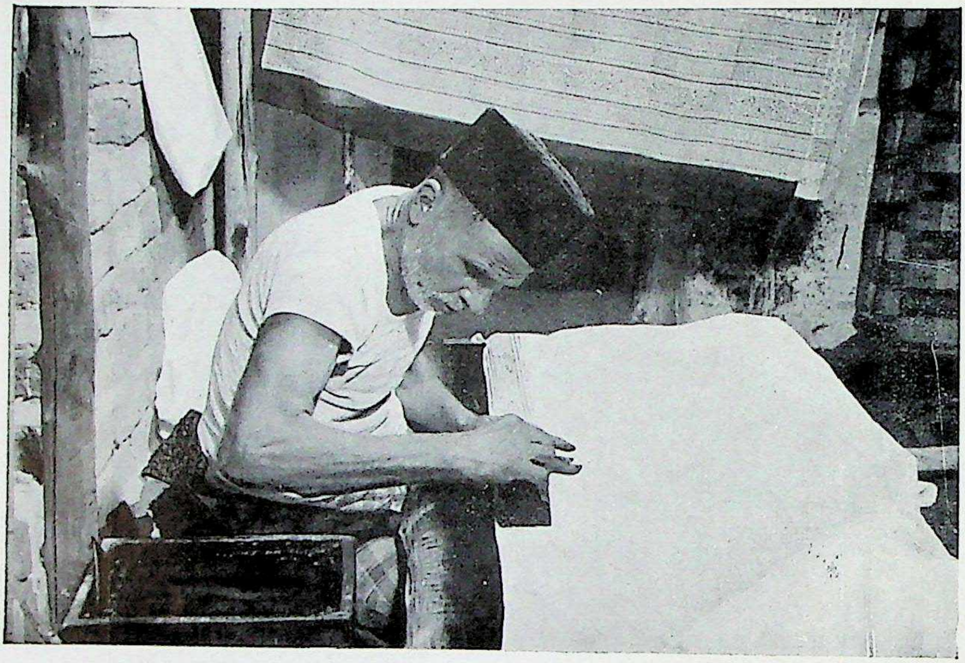
"*...the fine chittes have the most delicately worked designs...the blocks are more artistically made...*"
Georges Roques, in 1678 A.D.

Plate 1. A block-cutter of Ahmedabad today.

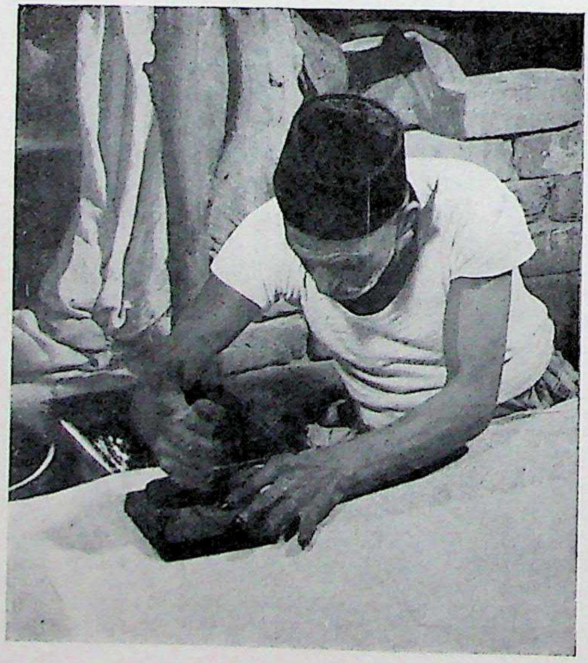


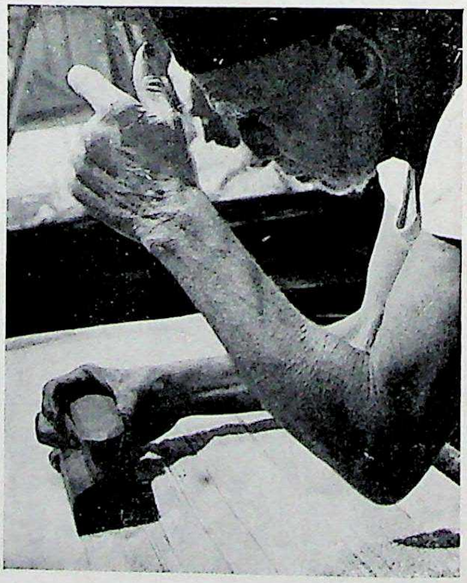
"...see them at work...go to
the workers' houses..."
Georges Roques in 1678 A.D.

Plate 2. A cotton printer making a block-printed sari, Ahmedabad 1968.



"He takes the first block of the pattern...and begins his cloth at the end of the piece...he makes a row along the left side..."





" A fine sharp block cannot be used on a coarse cloth... for the block would be cracked at the second blow in printing . . "
Georges Roques in 1678 A.D.

Plate 3. The cotton printer (*chippa*) still works exactly as Roques described. Each time he places the block on the cloth, he gives it two sharp blows with his fist, to make a clear imprint on the fabric.

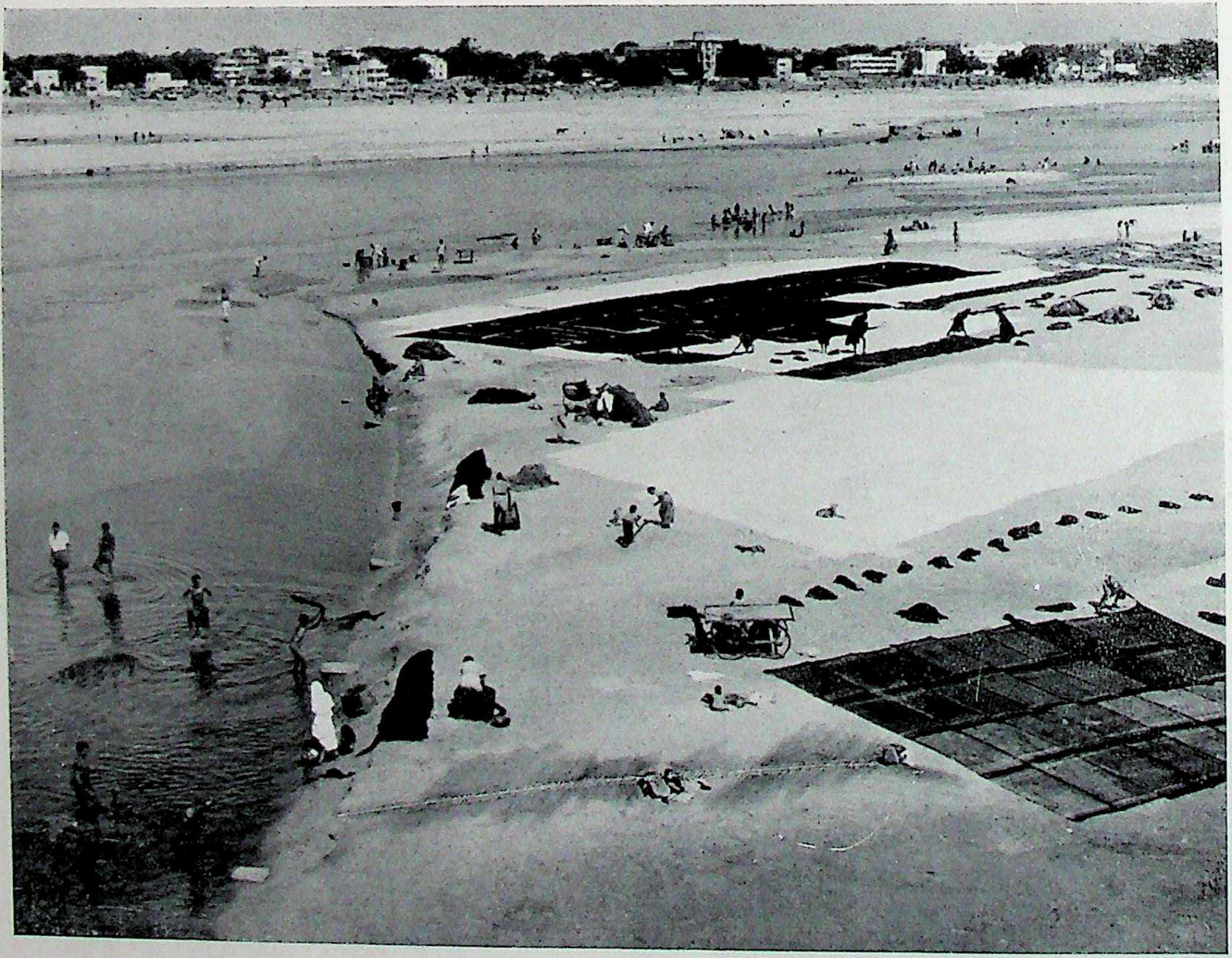
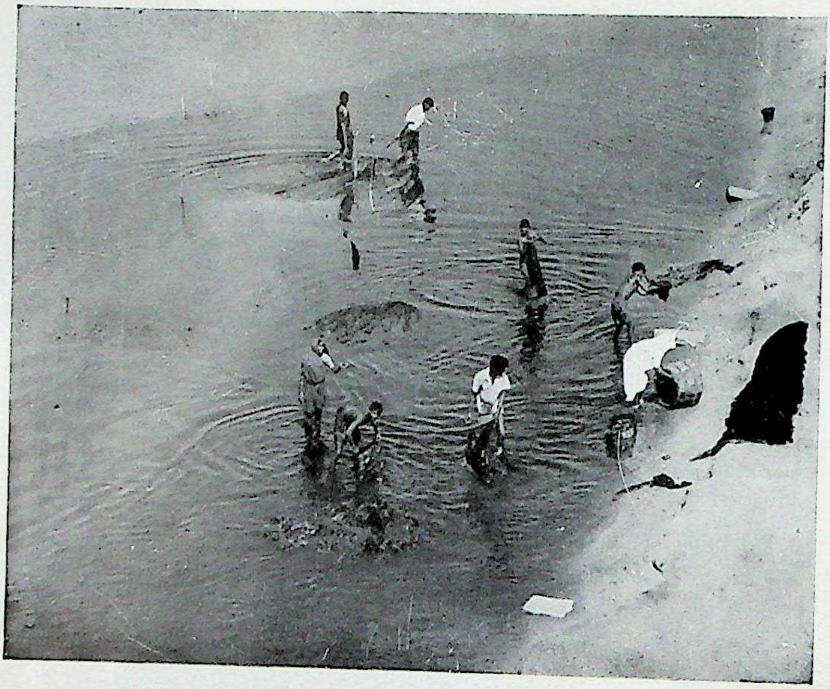
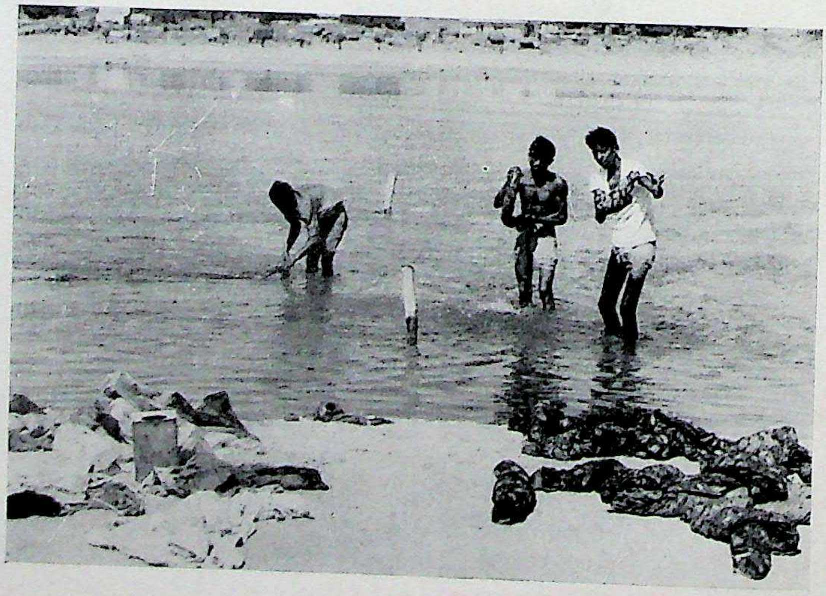


Plate 4. The river at
Ahmedabad, 1968.

"encourage the workers...go frequently to the river
to ensure that they soak them in the water often
enough, which is necessary to produce a good colour..."
Georges Roques in 1678 A.D.

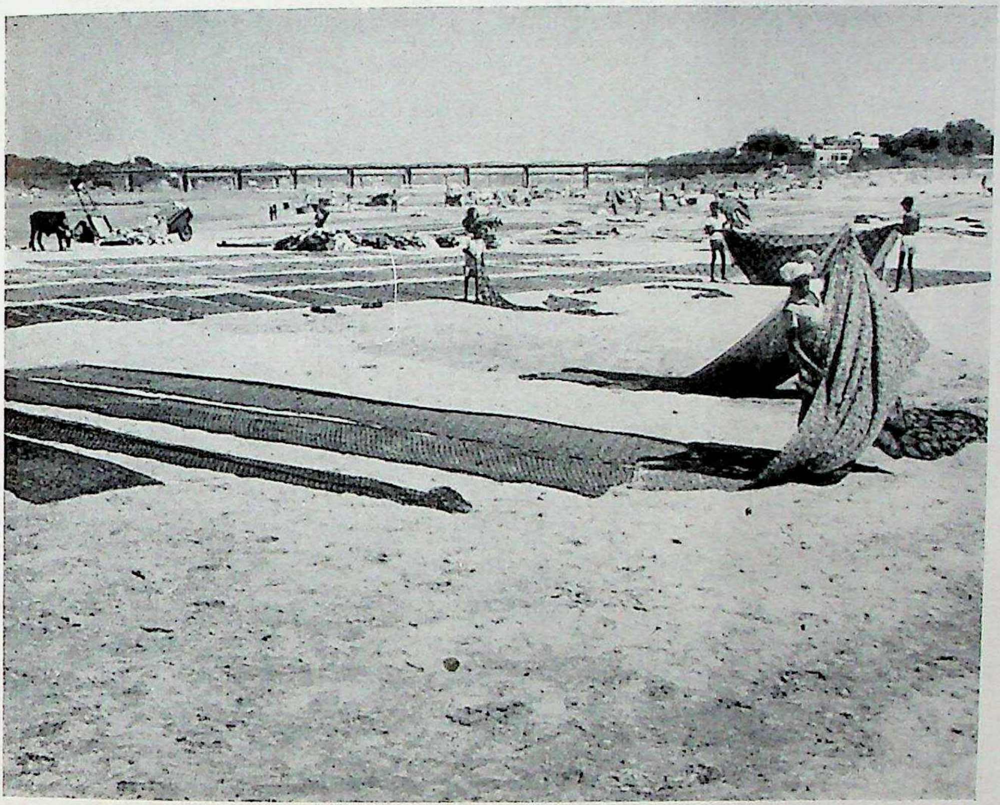


" ...they shake it in the water..."



" ...and put it to dry..." Georges Roques in 1678 A.D.

Plate 5. In 1968, cotton printers of Ahmedabad still wash the surplus colour from the printed cloths by shaking them in the running water of the river. When clean the cloths are wrung out and brought to the river bank, where they will be laid out to dry.



"...they dry it in the sun when it is very hot ... for as much as the sun gives heat, so also the colour becomes beautiful..."

Georges Roques in 1678 A.D.

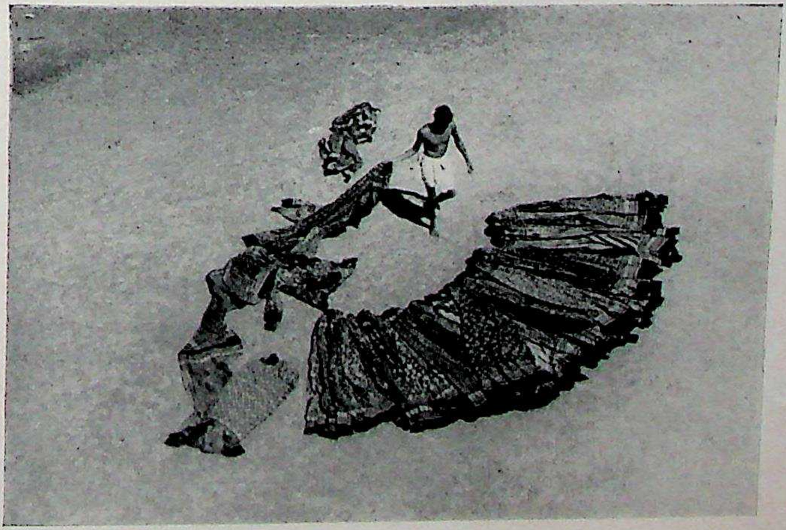
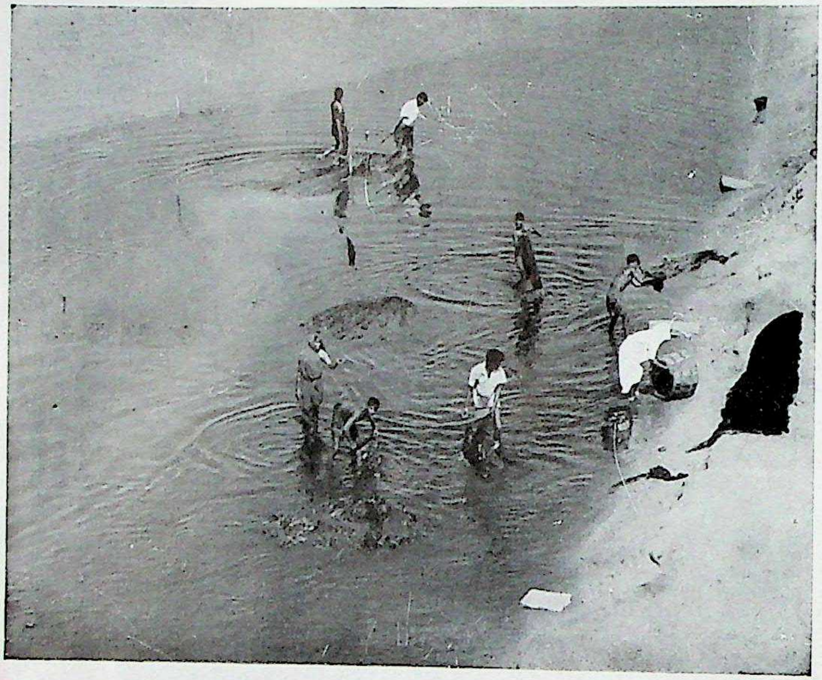
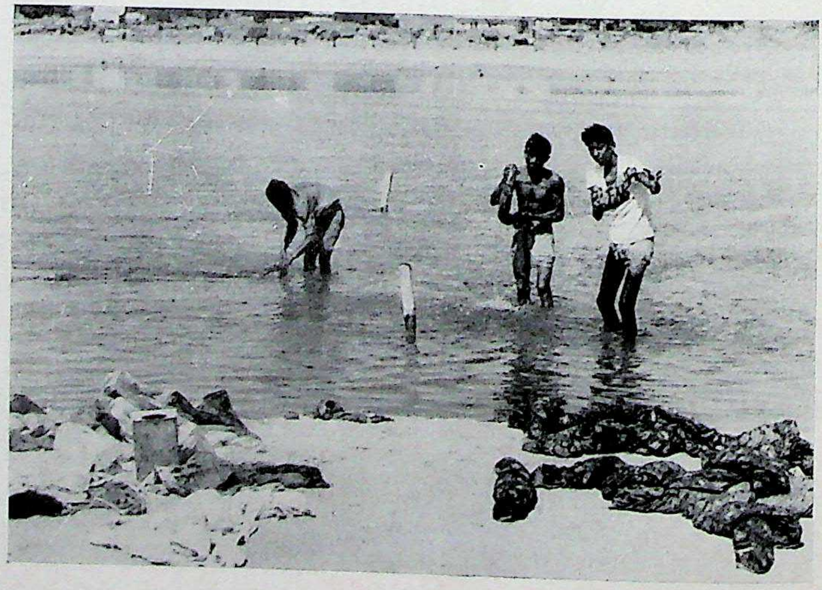


Plate 6. Printed cotton saris drying in the sun by the river at Ahmedabad, in 1968. The finished saris are folded, to be taken back to the houses of the cotton printers.



" ...they shake it in the water..."



" ...and put it to dry..." *Georges Roques in* 1678 A.D.

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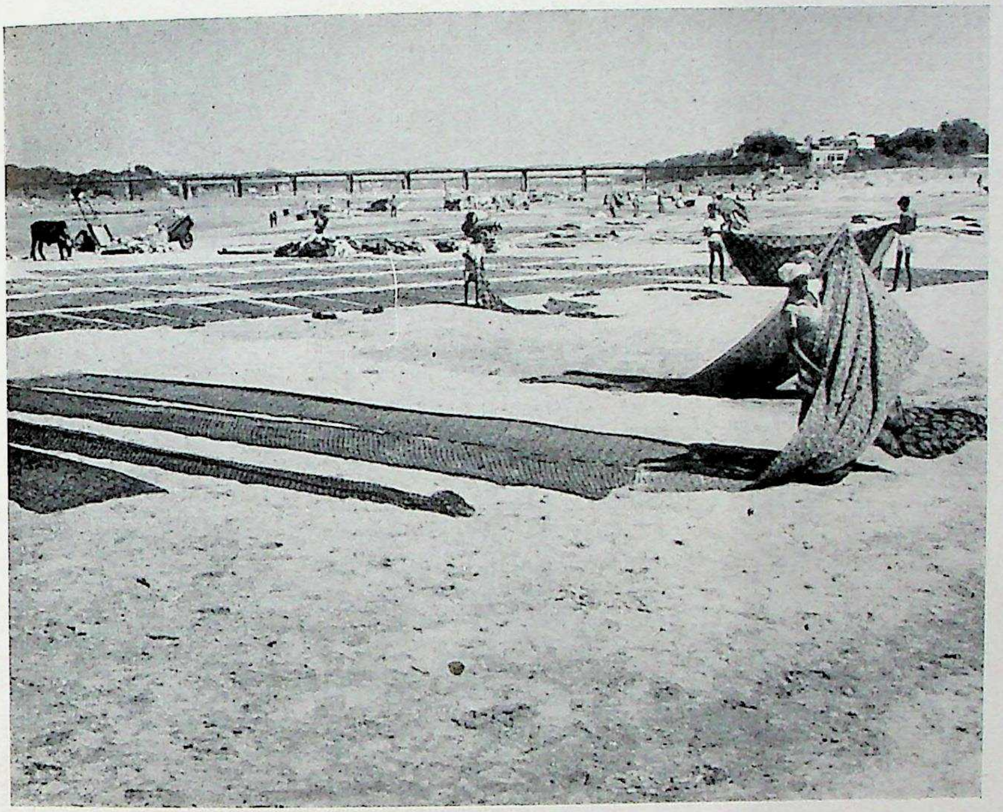

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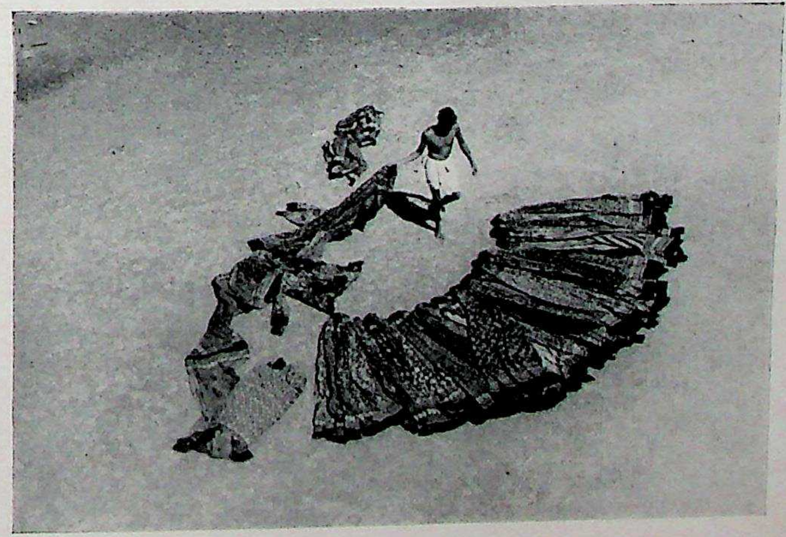

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